# Occupational Outlook Handbook

1982-83 Edition

U.S. Department of Labor
Raymond J. Donovan, Secretary

Bureau of Labor Statistics
Janet L. Norwood, Commissioner
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# Foreword

Raymond J. Donovan
Secretary of Labor

Few decisions that young people must make are more crucial to their future well-being than the selection of an occupation. For the young job-seeker, questions abound as to what skills are required in each field, and how those skills may be attained or refined. Furthermore, while job-seekers may be aware of their own abilities, they face the perplexing choice of selecting a field which promises the greatest economic and personal satisfaction.

In today's rapidly changing job market, it is not only the young who need current, accurate, and comprehensive career information. The choices are no easier for persons seeking a career change, or for those entering the labor force at later stages in their lives. The availability of career information is vital to these people as well, and to our Nation as a whole.

The *Occupational Outlook Handbook* is an invaluable primary source of vocational guidance information. In clear language, it describes what workers do in each job; the training and education they need; earnings; working conditions; and expected job prospects for selected occupations covering a wide spectrum of the economy. I am certain that the updated 1982–83 edition of the *Occupational Outlook Handbook* will provide valuable assistance to everyone seeking satisfying and productive employment.



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# Prefatory Note

Janet L. Norwood
Commissioner,
Bureau of Labor Statistics

Information on tomorrow's career opportunities must be available for today's youth and others if they are to prepare realistically for their future in the world of work. For four decades, the Bureau of Labor Statistics has conducted research on employment in occupations and industries for use in vocational guidance. A major product of this research is the *Occupational Outlook Handbook*.

The *Handbook* represents the most current and comprehensive information available on work today and job prospects for tomorrow. Revised every two years, this 15th edition of the *Handbook* covers about 250 occupations. For each of these occupations, the *Handbook* provides information about job duties, working conditions, level and places of employment, education and training requirements, advancement possibilities, job outlook, earnings, and other occupations that require similar aptitudes, interests, or training. *Handbook* information is based on data from a variety of sources, including business firms, trade associations, labor unions, professional societies, research organizations, educational institutions, and government agencies.

This edition of the *Handbook* also includes information about the effect of the business cycle, defense spending, energy development, and other economic variables on occupational employment. In addition, occupations are grouped according to the new *Standard Occupational Classification Manual,* 1980 edition. The *Handbook* also contains an index referenced to the most recent edition of the *Dictionary of Occupational Titles*.



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# Contributors

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# Note

A great many trade associations, professional societies, unions, and industrial organizations are able to provide career information that is valuable to counselors and jobseekers. For the convenience of *Handbook* users, some of these organizations are listed at the end of each occupational statement. Although these references were assembled carefully, the Bureau of Labor Statistics has neither authority nor facilities for investigating the organizations listed. Also, because the Bureau does not preview all the information or publications that may be sent in response to a request, it cannot guarantee the accuracy of such information. The listing of an organization, therefore, does not constitute in any way an endorsement or recommendation by the Bureau or the U.S. Department of Labor, either of the organization and its activities or of the information it may supply. Each organization has sole responsibility for whatever information it may issue.

The occupational information contained in the *Handbook* presents a general, composite description of jobs and cannot be expected to reflect work situations in specific establishments or localities. The *Handbook,* therefore, is not intended and should not be used as a guide for determining wages, hours, the right of a particular union to represent workers, appropriate bargaining units, or formal job evaluation systems.



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Comments about the contents of this publication and suggestions for improving it are welcome. Please address them to Chief, Division of Occupational Outlook, Bureau of Labor Statistics, U.S. Department of Labor, Washington, D.C. 20212.



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# Contents


1 **Guide to the Handbook**

1 HOW TO GET THE MOST FROM THE HANDBOOK

5 WHERE TO GO FOR MORE INFORMATION

13 TOMORROW'S JOBS

20 ASSUMPTIONS AND METHODS USED IN PREPARING THE EMPLOYMENT PROJECTIONS

22 **Occupations**

22 ADMINISTRATIVE AND MANAGERIAL OCCUPATIONS

23 Accountants and auditors
25 Bank officers and managers
26 Buyers
28 City managers
30 College student personnel workers
32 Construction inspectors (government)
33 Credit managers
34 Health services administrators
36 Health and regulatory inspectors (government)
38 Hotel managers and assistants
40 Medical record administrators
41 Occupational safety and health workers
43 Personnel and labor relations specialists
46 Purchasing agents
47 School administrators
49 Underwriters

51 ENGINEERS, SURVEYORS, AND ARCHITECTS

51 Architects
53 Landscape architects
54 Surveyors and surveying technicians

57 **Engineers**
58 Aerospace engineers
59 Agricultural engineers
60 Biomedical engineers
60 Ceramic engineers
61 Chemical engineers
62 Civil engineers
62 Electrical engineers
63 Industrial engineers
63 Mechanical engineers
64 Metallurgical engineers
64 Mining engineers
65 Petroleum engineers

67 NATURAL SCIENTISTS AND MATHEMATICIANS

68 **Mathematical scientists and systems analysts**
68 Actuaries
70 Mathematicians
71 Statisticians
72 Systems analysts

75 **Physical scientists**
75 Astronomers
76 Chemists
77 Geographers
80 Geologists
82 Geophysicists
83 Meteorologists
84 Oceanographers
86 Physicists

88 **Life scientists**
88 Agricultural and biological scientists
90 Biochemists
91 Food technologists
92 Foresters
94 Range managers
95 Soil conservationists

97 SOCIAL SCIENTISTS, SOCIAL WORKERS, RELIGIOUS WORKERS, AND LAWYERS

97 Lawyers

101 **Social scientists and urban planners**
101 Anthropologists
104 Economists
106 Historians
109 Market research analysts
110 Political scientists
112 Psychologists
115 Sociologists
117 Urban and regional planners

119 **Social and recreation workers**
119 Social workers
121 Recreation workers

124 **Religious workers**
124 Protestant ministers
125 Rabbis
127 Roman Catholic priests

129 TEACHERS, LIBRARIANS, AND COUNSELORS

129 College career planning and placement counselors
131 College and university faculty
133 Cooperative extension service workers
134 Employment counselors
135 Kindergarten and elementary school teachers
138 Librarians
141 Rehabilitation counselors
143 School counselors
144 Secondary school teachers

147 HEALTH DIAGNOSING AND TREATING PRACTITIONERS

147 Chiropractors
148 Dentists
150 Optometrists
152 Osteopathic physicians
153 Physicians
156 Podiatrists
157 Veterinarians

159 REGISTERED NURSES, PHARMACISTS, DIETITIANS, THERAPISTS, AND PHYSICIAN ASSISTANTS

160 Dietitians
161 Occupational therapists
163 Pharmacists
165 Physical therapists
167 Physician assistants
169 Registered nurses
171 Respiratory therapy workers
172 Speech pathologists and audiologists

175 HEALTH TECHNOLOGISTS AND TECHNICIANS

175 Dental hygienists
177 Electrocardiograph technicians
179 Electroencephalographic technologists and technicians
180 Emergency medical technicians
183 Licensed practical nurses
184 Medical laboratory workers
186 Medical record technicians and clerks




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188 Radiologic (X-ray) technicians
190 Surgical technicians

192 WRITERS, ARTISTS, AND ENTERTAINERS

193 **Communications occupations**
193 Public relations workers
195 Radio and television announcers and newscasters
196 Reporters and correspondents
199 Writers and editors

201 **Design occupations**
201 Commercial and graphic artists and designers
203 Display workers
204 Floral designers
206 Industrial designers
207 Interior designers
209 Photographers

212 **Performing artists**
212 Actors and actresses
214 Dancers
215 Musicians
217 Singers

219 TECHNOLOGISTS AND TECHNICIANS, EXCEPT HEALTH

219 Air traffic controllers
221 Broadcast technicians
222 Drafters
223 Engineering and science technicians
227 Legal assistants
229 Library technicians and assistants
230 Programmers
232 Technical writers

235 MARKETING AND SALES OCCUPATIONS

235 Advertising workers
237 Automobile parts counter workers
239 Automobile sales workers
240 Cashiers
242 Insurance agents and brokers
243 Manufacturers sales workers
245 Models
247 Real estate agents and brokers
249 Retail trade sales workers
250 Securities sales workers
252 Travel agents
253 Wholesale trade sales workers

255 ADMINISTRATIVE SUPPORT OCCUPATIONS, INCLUDING CLERICAL

255 Airline reservation and ticket agents
256 Bank clerks
258 Bank tellers
259 Bookkeepers and accounting clerks
260 Claim representatives
262 Collection workers
263 Computer operating personnel
265 Hotel front office clerks
267 Mail carriers
268 Postal clerks
269 Receptionists
270 Secretaries and stenographers
273 Teacher aides
274 Telephone operators
276 Typists

279 SERVICE OCCUPATIONS

280 **Protective service occupations**
280 Correction officers
282 FBI special agents
283 Firefighters
284 Guards
286 Police officers
287 State police officers

290 **Food and beverage preparation and service occupations**
290 Bartenders
291 Cooks and chefs
293 Food and counter workers
294 Meatcutters
295 Waiters and waitresses
296 Waiters' assistants and kitchen helpers

298 **Health service occupations**
298 Dental assistants
299 Medical assistants
301 Occupational therapy assistants
302 Optometric assistants
303 Physical therapy assistants

305 **Cleaning and building service occupations**
305 Hotel housekeepers and assistants

307 **Personal service occupations**
307 Barbers
308 Bellhops and bell captains
309 Cosmetologists
311 Flight attendants

313 AGRICULTURAL AND FORESTRY OCCUPATIONS

313 Agriculture occupations
318 Forestry technicians

320 MECHANICS AND REPAIRERS

321 **Vehicle and mobile equipment mechanics and repairers**
321 Aircraft mechanics
323 Automobile body repairers
324 Automobile mechanics
326 Farm equipment mechanics
328 Truck mechanics and bus mechanics

330 **Electrical and electronic equipment repairers**
330 Appliance repairers
331 Central office craft occupations
333 Central office equipment installers
335 Computer service technicians
336 Electric sign repairers
338 Line installers and cable splicers
340 Maintenance electricians
341 Telephone and PBX installers and repairers
343 Television and radio service technicians

345 **Other mechanics and repairers**
345 Air-conditioning, refrigeration, and heating mechanics
346 Business machine repairers
348 Elevator constructors
350 Industrial machinery repairers
351 Millwrights
353 Piano and organ tuners and repairers
355 Pinsetter mechanics
356 Vending machine repairers
358 Watch repairers

360 CONSTRUCTION AND EXTRACTIVE OCCUPATIONS

361 **Construction occupations**
363 Bricklayers and stonemasons
364 Carpenters
366 Cement masons and terrazzo workers
368 Drywall installers and finishers
369 Electricians (construction)
371 Floor covering installers
372 Glaziers
374 Insulation workers
375 Ironworkers
377 Painters and paperhangers
379 Plasterers
380 Plumbers and pipefitters
382 Roofers
383 Sheet metal workers
385 Tilesetters

387 **Extractive occupations**
387 Coal mining operatives

390 PRODUCTION OCCUPATIONS

390 Blue-collar worker supervisors

392 **Precision production occupations**
392 All-round machinists
394 Automobile repair service estimators
395 Boilermaking occupations
396 Bookbinders and bindery workers
398 Compositors
399 Coremakers (Foundry)
401 Dental laboratory technicians
402 Dispensing opticians
404 Furniture upholsterers
405 Instrument makers (mechanical)
407 Jewelers
408 Lithographers
409 Molders (Foundry)
410 Opthalmic laboratory technicians
412 Patternmakers (Foundry)
413 Photoengravers
414 Photographic process workers



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416 Shoe repairers
417 Tool-and-die makers

419 **Plant and system operators**
419 Stationery engineers
421 Waste water treatment plant operators

423 **Machine operators, tenders, and setup workers**
423 Boiler tenders
424 Electrotypers and stereotypers
425 Forge shop occupations
427 Machine tool operators
429 Machine tool setup workers
430 Printing press operators and assistants
431 Production painters

433 **Fabricators, assemblers, and hand working occupations**
433 Assemblers
434 Automotive painters
436 Welders and flamecutters

438 TRANSPORTATION AND MATERIAL MOVING OCCUPATIONS

439 **Motor vehicle operators**
439 Intercity busdrivers
440 Local transit busdrivers
442 Local truckdrivers
443 Long distance truckdrivers

445 **Other transportation and material moving occupations**
445 Airplane pilots
447 Merchant marine officers
450 Merchant marine sailors
452 Operating engineers (construction machinery operators)

455 HELPERS, HANDLERS, EQUIPMENT CLEANERS, AND LABORERS

455 Construction laborers

457 MILITARY OCCUPATIONS

461 **Indexes**

461 DICTIONARY OF OCCUPATIONAL TITLES (D.O.T.) INDEX

471 INDEX TO OCCUPATIONS

482 **Reprints**



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# How to Get the Most from the Handbook

What do people do in their jobs? How much education and training will I need to enter a certain occupation? Will it be difficult to find a job? How much can I expect to earn? Whether you are preparing to enter the world of work for the first time, reentering the labor force after an absence, or planning to change your occupation, these and other questions may arise as you try to select a career that is right for you. With thousands of jobs to choose from, finding answers to these kinds of questions can be difficult. However, with sufficient research, you can make an informed and confident career choice.

**Where do I start?**

A good place to start your study of careers is the *Occupational Outlook Handbook*. The *Handbook* provides information on what jobs are like; education and training requirements; and advancement possibilities, earnings, and job outlook. While every possible job is not discussed, the *Handbook* provides detailed information on about 250 occupations.

Like a dictionary, encyclopedia, or other reference book, the *Handbook* is not meant to be read from beginning to end. You can simply look through the table of contents or alphabetical index, find an occupation or area of work that you are interested in, and read that section. If you want to get a general view of the economy and the world of work, read the chapter on Tomorrow's Jobs. It explains some of the changes taking place in the job market today and what is expected to happen through the 1980's.

If you are just beginning to plan for a career, you may wonder what things you should consider. Start by listing your interests, abilities, and goals. Does science or art interest you? Do you enjoy working with your hands and building things, or do you really prefer working with people? Is money, recognition, or being a leader important to you? Once you have answered these and similar questions, you will be better able to choose an occupation or area of work that most closely matches your personal characteristics. Of course, assessing your traits and aptitudes is very difficult. Ask others to help you. Your school counselor has special tests that can help you learn about yourself. Your family, friends, and neighbors can also provide useful assistance.

Once you have decided what your interests are, use the *Handbook* to find occupations and areas of work that match your interests. The occupations in the *Handbook* are grouped in 20 clusters of related jobs. So, if you find that you enjoy fixing things, you might start by looking at occupations in the cluster on mechanics and repairers. Or, if you want to make helping other people your life's work, you might look at occupations in 1 of the 3 health clusters. The 20 occupational clusters are:

—Administrative and managerial occupations.
—Engineers, surveyors, and architects.
—Natural scientists and mathematicians.
—Social scientists, social workers, religious workers, and lawyers.
—Teachers, librarians, and counselors.
—Health diagnosing and treating practitioners.
—Registered nurses, pharmacists, dietitians, therapists, and physician assistants.
—Health technologists and technicians.
—Writers, artists, and entertainers.
—Technologists and technicians, except health.
—Marketing and sales occupations.
—Administrative support occupations, including clerical.
—Service occupations.
—Agricultural and forestry occupations.
—Mechanics and repairers.
—Construction and extractive occupations.
—Production occupations.
—Transportation and material moving occupations.
—Helpers, handlers, equipment cleaners, and laborers.
—Military occupations.

**About Those Numbers at the Head of Each Statement**

The numbers in parentheses that appear just below the title of most occupational statements are *D.O.T.* code numbers. D.O.T. stands for the *Dictionary of Occupational Titles* (fourth edition), a U.S. Department of Labor publication. Each number helps classify jobs by the type of work done, required training, physical demands, and working conditions. D.O.T. numbers are used by Job Service offices to classify applicants and job openings, and for reporting and other operating purposes. They are included in the *Handbook* because career information centers and libraries frequently use them for filing occupational information. An index listing *Handbook* occupations by D.O.T. number may be found just before the alphabetical index in the back of this book.

**What will I learn?**

Once you have chosen an occupation or cluster you'd like to learn more about, go to that section of the *Handbook*. Each occupational description follows a standard format. There are sections on the nature of the work; working conditions; employment; training, other qualifications, and advancement; job outlook; earnings; related occupations; and sources of additional information.

**Nature of the work.** An important part of your career decision will be whether the work done on the job appeals to you. In this section, you will discover what workers do on the job, what tools or equipment they use, and how they do their tasks. To get a better understanding of how the work in various occupations differs, you should read several different occupational descriptions and compare them. This will allow you to match your abilities, interests, and goals with the type of work done in a particular job or employment setting.

**Working conditions.** When considering an occupation, you may want to know the conditions under which you would have to work. Some working conditions may not be desirable while others may appeal to you. Most jobs offer a little of both. For example, when overtime is required, employees must give up some of their free time and be flexible in their personal lives. This is offset, however, by the opportunity to earn extra income or time off.

Evening or nightwork is part of the regular work schedule in many jobs. Bartenders, guards, and some factory workers may be required to work these shifts on a permanent basis. Workers in other occupations, such as nurses and police officers, may work nights on a rotating basis. Still other workers may be assigned to split shifts: Busdrivers, for example, may work morning and evening rush hours with time off in the middle of the day. However, some people prefer shiftwork because they can pursue leisure activities or take care of errands during daytime hours.

Work settings vary greatly. People work in office buildings; on construction sites; in mines, factories, restaurants, and stores; and on ships and planes. Some people like a quiet, air-conditioned setting; others prefer the hum of machinery. By knowing the setting of jobs you find interesting, you can avoid working in an environment that you would find unpleasant.

Many workers have to be outdoors some or all of the time. Mail carriers, construction workers, firefighters, and foresters are a few examples. Being exposed to all types of weather may be preferred to indoor work, however, by those who enjoy the outdoors and consider it healthy.

Some jobs are potentially dangerous. Cuts, burns, and falls can occur in restaurant kitchens, factory assembly lines, and forge shops, for example. Consequently, many jobs, such as mining and construction work, require the use of specially designed equipment and protective clothing.

Some jobs require standing, crouching in awkward positions, heavy lifting, or are otherwise strenuous. Be sure you have sufficient



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physical strength and stamina for the work you are interested in.

**Employment.** Information on the number of workers in an occupation is important because large occupations, even those growing slowly, provide more job openings than small ones as workers leave the occupation for a variety of reasons.

This section also tells whether workers in an occupation are concentrated in certain industries or geographic areas. Some jobs, such as secretaries, are found throughout the country in almost every industry. Others, like actors and actresses, are concentrated in certain parts of the country. This type of information helps you know where to go to look for the kind of job you want. It also is useful to those who have strong preferences about where they live.

In addition, information on part-time employment may be included. For students, homemakers, retired persons, and others who may want to work part time, knowing which occupations offer good opportunities for part-time work can be a valuable lead in finding a job.

**Training, other qualifications, and advancement.** This section should be read carefully because preparing for an occupation can mean a considerable investment of time and money. If you currently are in school, it's a good idea to look closely at the high school and college courses considered useful preparation for the career you have in mind.

Workers can prepare for jobs in a variety of ways, including college study leading to a degree, certificate, or associate degree; programs offered by public and private postsecondary vocational schools; home study courses; government training programs; experience or training obtained in the Armed Forces; apprenticeship and other formal training offered by employers; and high school courses. For each occupation, the *Handbook* identifies the preferred training. In many cases, alternative ways of obtaining training are listed as well. Remember, the amount of training you have often determines the level at which you enter an occupation and the speed with which you advance.

For many occupations, certification or licensure is required. Physicians and nurses, elementary and secondary school teachers, barbers and cosmetologists, and electricians and plumbers are examples of workers who must be licensed. This section identifies occupations that require licensure and what the general requirements are. However, States vary in their licensure requirements for certain occupations. If you are considering an occupation that requires licensure, be sure to check with the appropriate State agency about specific requirements. Common requirements for a license include completion of a State-approved training or educational program and passing a written examination.

In addition to education, training, and licensure requirements, this section discusses the personal qualities generally needed by workers in a particular job. For example, a job may require a person who can make responsible decisions, enjoys working with other people, and can work in a highly competitive atmosphere. This information will allow you to match your personality—your likes and dislikes—with those required in a certain occupation.

The world of work is constantly changing and today fewer people spend their lives in a single occupation. Roughly 1 worker in 9 changes his or her occupation each year. Some have several jobs over a lifetime, changing careers as they learn new skills or feel a need to try another line of work. If a pattern of movement exists from an occupation to another, it is discussed in this part of each *Handbook* chapter. It is helpful to know, for example, that certain jobs are stepping stones to others. Skills gained working at one job can make you more employable in another—perhaps a job that is more desirable in terms of earnings, working conditions, or self-expression. In addition, it is useful to know which jobs offer the best opportunities for transferring to other work of a similar nature. Persons trained in electrical or chemical engineering, for example, frequently can transfer to another engineering specialty where they can apply general engineering knowledge in different ways. Similarly, many computer programmers move into systems analyst jobs after several years of experience.

In some cases, moving from one occupation to another takes more than the training or experience acquired on the job. For example, a hospital aide must have a year of specialized training before advancing to licensed practical nurse. Many *Handbook* statements describe the possibilities for advancement after additional training and note any in-service programs that allow employees to gain needed skills while continuing to work part time.

Because local job markets vary significantly, it usually is wise to discuss patterns of job transfer and advancement with counselors, local employers, and others who know about the particular job market where you want to work.

**Job outlook.** While your interests, abilities, and career goals are extremely important, you also need to know something about the availability of jobs in the fields that interest you most. This section discusses prospective employment opportunities for each occupation. In most cases, the information about job prospects begins with a sentence about the expected change in employment through the 1980's (figure I). In general, if expansion in an occupation is expected to be as fast as or faster than the average for all occupations, job opportunities should be favorable. Occupations in which employment is likely to grow more slowly than the average, stay about the same, or decline generally offer less favorable job prospects. For most occupations, the specific factors that are expected to influence an occupation's rate of growth are discussed.

For some occupations, information is available on the supply of workers—that is, the number of people pursuing the required type of education or training and the number subsequently entering the occupation. When such information is available, the job outlook describes prospective employment opportunities in terms of the expected demand-supply relationship. The job outlook is termed excellent when the demand for workers is likely to greatly exceed the supply of workers; keenly competitive when the supply of workers is likely to exceed the demand for them. The precise terms used in the *Handbook* are shown in figure II.

**Figure I**

| Description | Projected 1980–90 change in employment requirements |
|---|---|
| Much faster than the average for all occupations | 50.0 percent or more |
| Faster than the average for all occupations | 28.0 percent to 49.0 percent |
| About as fast as the average for all occupations[1] | 15.0 percent ot 27.0 percent |
| More slowly than the average for all occupations | 6.0 percent to 14.0 percent |
| Little change is expected | 5.0 percent to −5.0 percent |
| Expected to decline | −6.0 percent or more |

[1]The average increase projected for all occupations over the 1980–90 period is between 17.1 percent and 25.3 percent.

**Figure II**

| Job opportunities | Prospective demand-supply relationship |
|---|---|
| Excellent | Demand much greater than supply |
| Very good | Demand greater than supply |
| Good or favorable | Rough balance between demand and supply |
| May face competition | Likelihood of more supply than demand |
| Keen competition | Supply greater than demand |

Workers who transfer into one occupation from another sometimes are a significant part of the supply of workers; similarly, those who transfer out may have a substantial effect on demand because their leaving usually creates job openings. When information is available, the job outlook section describes transfer patterns and their effect on the demand for and supply of workers in certain occupations. The employment outlook for engineers, for example, recognizes that transfers into the field are likely to constitute a substantial portion of supply, if past trends continue.



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In many cases, a statement is made about the effect on employment of fluctuations in economic activity. This information is valuable to people looking into long-range career possibilities at a time when the economy is in a recession. You may understandably wonder: What will the economy be like when I enter the labor market? Will it be harder to find a job 5 or 10 years fom now than it is today? What are the chances that I might be laid off from my job? The *Handbook* gives information, wherever possible, on the sensitivity of employment in an occupation to changes in economic conditions. Bear in mind that employment in many—but not all—occupations is affected by economic downturns, and that the outlook for these occupations generally improves as the economy picks up. Other occupations—programmers, systems analysts, and computer operators are prime examples—are less vulnerable to short-term changes in economic activity. Their growth or decline is influenced by other factors discussed in this section.

The information in the job outlook section should be used carefully. The prospect of relatively few openings, or of strong competitions, in a field that interests you should make you take a second look at your career choice. But this information alone should not prevent you from pursuing a particular career, if you feel confident in your ability and are determined to reach your goal.

Remember, even occupations that are small provide some jobs. So do occupations in which employment is growing very slowly or even declining, for there is always a need to replace workers who transfer to another occupation or leave the labor force. If the occupation is large, the number of job openings arising from replacement needs can be substantial. Secretaries, retail trade salesworkers, and kindergarten and elementary school teachers are examples of occupations that provide a significant number of job openings each year as workers leave. On the average, openings resulting from replacement needs are expected to account for the vast majority of all job openings in the next 10 years.

Also keep in mind that no one can predict future labor market conditions with perfect accuracy. In every occupation and industry, the number of jobseekers and job openings constantly changes. A rise or fall in the demand for a product or service affects the number of workers needed to produce it. New inventions and technological innovations create some jobs and eliminate others. Changes in the size or age distribution of the population, work attitudes, training opportunities, and retirement programs determine the number of available workers. As these forces interact in the labor market, some occupations experience a shortage of workers, some a surplus, and some a balance between jobseekers and job openings. Methods used by economists to develop information on future occupational prospects differ, and judgments that go into any assessment of the future also differ. For every occupation covered in the *Handbook*, an estimate of future employment needs is developed. These estimates are consistent with a set of assumptions about the future of the economy and the country. For an explanation of how these projections are developed, see the chapter entitled Assumptions and Methods Used in Preparing the Employment Projections.

Finally, job prospects in your community or State may not correspond to the description of the job outlook in the *Handbook*. For the particular job you are interested in, the outlook in your area may be better or worse. The *Handbook* does not discuss the outlook in local areas; such information has been developed, however, by many States and localities. The local office of your State employment service is the best place to ask about local area employment projections. Names and addresses of sources and suggestions for additional information on the job market are given in the following chapter, Where to Go for More Information.

**Earnings.** This section helps answer many of the questions that you may ask when choosing a career. Will the income be high enough to maintain the standard of living I want and to justify my training costs? How much will my earnings increase as I gain experience? Do some areas of the country or some industries offer better pay than others for the same type of work? Remember to look at both money income and *fringe benefits*, which often are a substantial part of total earnings.

About 9 out of 10 workers receive money income in the form of a *wage* or *salary*. Often, wage and salary workers who work overtime, irregular hours, or on the night shift receive an additional percentage of their regular wage or salary.

Some workers, such as waiters and waitresses, also receive tips based on the services they provide to customers. Automobile sales workers and real estate agents are among workers who are paid a commission—a percent of the amount they sell. Factory workers are sometimes paid a piece rate—a set amount for each item they produce.

The remaining 10 percent of all workers are in business for themselves and earn *self-employment* income instead of, or in addition to, a wage or salary. Self-employed workers keep the income that exceeds the expenses they incur in carrying out their job. Physicians, barbers, photographers, and lawyers are examples of workers who are frequently self-employed.

Some occupations may offer a chance to supplement their wage or salary income with self-employment income. For example, electricians and carpenters often do small repair or remodeling jobs during evenings or weekends, and college professors frequently are paid for articles they publish based on their independent research.

Besides money income, most wage and salary workers receive a variety of *fringe benefits* as part of their earnings on the job. In addition to those required by Federal and State law, such as social security, workers' compensation, and unemployment insurance, fringe benefits usually include paid vacations and holidays, and, often, sick leave. In addition, many workers are covered by life, health, and accident insurance; retirement plans; and supplemental unemployment benefits. All of these benefits are provided—in part or in full—by their employers. Some employers also offer stock options and profit-sharing plans, saving plans, and bonuses.

Workers in many occupations receive part of their earnings in the form of goods and services, or *payments in kind*. Sales workers in department stores, for example, often receive discounts on merchandise. Some private household workers receive free meals and housing. Flight attendants and other airline employees often are entitled to reduce fares for themselves and their families on their own and other airlines. Workers in other jobs may receive uniforms, business expense accounts, or use of a company car.

Which jobs pay the most? This is a difficult question to answer because good information is available for only one type of earnings—wages and salaries—and for some occupations even this is unavailable. Nevertheless, the *Handbook* does include some comparisons of earnings among occupations. Generally, earnings are compared to the average earnings of workers in private industry who are not supervisors and not in farming. This group represented about 60 percent of all workers in 1980.

Besides differing among occupations, pay levels may differ within each occupation. Beginning workers almost always earn less than experienced workers (table 1). Earnings in an occupation usually vary by geographic area as

**Table 1. Career ladder of drafters**

| | Average annual earnings, 1980 |
|---|---|
| Tracers (beginners) | $10,200 |
| Experienced drafters | 11,700–17,200 |
| Senior drafters | 21,700 |

SOURCE: Bureau of Labor Statistics.

**Table 2. Average weekly earnings of beginning computer programmers, 1980, selected cities**

| City | Earnings |
|---|---|
| Detroit | $346.50 |
| Miami | 321.50 |
| Los Angeles | 314.50 |
| Chicago | 311.00 |
| Houston | 308.50 |
| Milwaukee | 291.00 |
| Minneapolis-St. Paul | 289.50 |
| Dallas | 282.00 |
| Baltimore | 276.00 |
| Boston | 258.00 |

SOURCE: Bureau of Labor Statistics.



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well (table 2). The average weekly earnings of beginning computer programmers, for example, vary considerably from city to city. Of the 10 cities listed, the highest earnings occurred in Detroit, Mich., and the lowest in Boston, Mass. Although it is generally true that earnings are higher in the North Central and Northeast regions than in the West and South, there are exceptions. You also should keep in mind that the cities that offer the highest earnings often are those in which it is most expensive to live. Salaries also vary by the specialty or type of work performed. For example, surgeons earn more on the average than any other medical specialty (table 3).

Because of all these variations in earnings, you should check with a counselor or with local employers if you are interested in specific information for occupations in your area.

**Related occupations.** If you find that an occupation you are reading about appeals to you, you also may wish to explore the jobs listed in this section. Usually, the related occupations are those that require similar aptitudes, interests, and education and training.

**Sources of additional information.** The *Handbook* is only one source of career information. Many associations, government agencies, unions, and other organizations provide useful information on careers. In this section, names and addresses of various organizations are listed to help you further your research into careers that interest you. The next chapter of the *Handbook* Where to Go for More Information—also suggests ways to learn more about jobs.

**Table 3. Estimated annual earnings of private physicians, 1980, by speciality**

| Specialty | Earnings[1] |
|---|---|
| Surgery | $94,100 |
| Anesthesiology | 84,800 |
| Obstetrics/gynecology | 80,000 |
| Internal medicine | 72,600 |
| General practice | 60,300 |
| Pediatrics | 59,100 |

[1] After tax-deductible expenses but before income taxes.

SOURCES: American Medical Association; Bureau of Labor Statistics.



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# Where to Go for More Information

Whether you have questions about a particular job or are trying to compare various fields, the *Occupational Outlook Handbook* is a good place to begin. The *Handbook* will answer many of your initial questions. But remember that it is only one of many sources of information about jobs and careers. After reading a few *Handbook* statements, you may decide that you want more detailed information about a particular occupation. You may want to find out where you can go for training, or where you can find this kind of work in your community. If you are willing to make an effort, you will discover that a wealth of information is available.

## Sources of Career Information

**Government agencies, professional societies, trade associations, labor unions, corporations, and educational institutions** put out a great deal of free or low-cost career material. Write for information to the organizations listed in the Sources of Additional Information section at the end of every *Handbook* statement. Other organizations that publish career information are listed in directories in your library's reference section. One of the largest directories is *Encyclopedia of Associations* (Detroit: Gale Research Company, 1980), a multivolume publication that lists thousands of trade associations, professional societies, labor unions, and fraternal and patriotic organizations. There are dozens of other directories, however. Ask the librarian for help in locating directories that list:

—trade associations.
—professional associations.
—business firms.
—community and junior colleges.
—colleges and universities.
—home study and correspondence programs.
—business, trade, and technical schools.

Lists of organizations that distribute career information also may be found in books and directories put out by several commercial publishers.

*A Counselor's Guide to Occupational Information,* published in 1980 by the U.S. Department of Labor, identifies pamphlets, brochures, monographs, and other career guidance publications prepared by Federal agencies. An invaluable resource for students and jobseekers as well as for counselors, *A Counselor's Guide* can be purchased for $4.00 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Orders should include the GPO stock number, 029-001-02490-8.

The National Audiovisual Center, a central source for all audiovisual material produced by the U.S. Government, provides lists of free materials in a number of subject areas, including career education. Contact the National Audiovisual Center, General Services Administration, Reference Section/PR, Washington, D.C. 20409. Phone: (301) 763–1896.

Carefully assess any career materials you obtain. Keep in mind the date and source, in particular. Material that is too old may contain obsolete or even misleading information. Be especially cautious about accepting information on employment outlook, earnings, and training requirements if it is more than 5 years old. The source is important because it affects the content. Although some occupational materials are produced solely for the purpose of objective vocational guidance, others are produced for recruitment purposes. You should be wary of biased information, which may tend to leave out important items, overglamorize the occupation, overstate the earnings, or exaggerate the demand for workers.

**Libraries, career centers, and guidance offices** are important sources of career information. Thousands of books, brochures, magazines, and audiovisual materials are available on such subjects as occupations, careers, self-assessment, and job hunting. Your school library or guidance office is likely to have some of this material; ask the staff for help. Collections of occupational material also can be found in public libraries, college libraries, learning resource centers, and career counseling centers.

Begin your library search by looking in an encyclopedia under "vocations" or "careers," and then look up specific fields. The card catalog will direct you to books on particular careers, such as architect or plumber. Be sure to check the periodical section, too. You'll find trade and professional magazines and journals in specific areas such as automotive mechanics or interior design. Some magazines have classified advertising sections that list job openings. Many libraries and career centers have pamphlet files for specific occupations. Collections of occupational information may also include nonprint materials such as films, filmstrips, cassettes, tapes, and kits. Computerized occupational information systems enable users to obtain career information instantly. In addition to print and nonprint materials, most career centers and guidance offices offer individual counseling, group discussions, guest speakers, field trips, and career days.

**Counselors** play an important role in providing career information. Vocational testing and counseling are available in a number of places, including:

—guidance offices in high schools.
—career planning and placement offices in colleges.
—placement offices in vocational schools.
—vocational rehabilitation agencies.
—counseling services offered by community organizations, commercial firms, and professional consultants.
—Job Service offices affiliated with the U.S. Employment Service.

The reputation of a particular counseling agency should be checked with professionals in the field. As a rule, counselors will not tell you what to do. Instead, they are likely to administer interest inventories and aptitude tests; interpret the results; talk over various possibilities; and help you explore your options. Counselors are familiar with the job market and also can discuss entry requirements and costs of the schools, colleges, or training programs that offer preparation for the kind of work in which you are interested. Most important of all, a counselor can help you consider occupational information in relation to your own abilities, aspirations, and goals.

Don't overlook the importance of **personal contacts.** Talking with people is one of the best ways of learning about an occupation. Most people are glad to talk about what they do and how well they like their jobs. Have specific questions lined up; you might question workers about their personal experiences and knowledge of their field. By asking the right questions, you will find out what kind of training is really important, how workers got their first jobs as well as the one they're in now, and what they like and dislike about the work. These interviews serve several purposes: you get out into the business world, you learn about an occupation, you become familiar with interviewing, and you meet people worth contacting when you start looking for a job.

**State occupational information coordinating committees** can help you find information about the job situation in your State or area. By contrast, the *Handbook* provides information for the Nation as a whole. The committee may provide the information directly, or refer you to other sources. In many States, it can also tell you where you can go to use the State's career information system. To find out what career materials are available, write to the director of your State occupational information coordinating committee. Following are their addresses and telephone numbers:



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## Alabama

Director, Alabama Occupational Information Coordinating Committee, First Southern Towers, Suite 402, 100 Commerce St., Montgomery, Ala. 36130. Phone: (205) 832–5737.

## Alaska

Coordinator, Alaska Occupational Information Coordinating Committee, Pouch F — State Office Bldg., Juneau, Alaska 99811. Phone: (907) 465–2980.

## Arizona

Executive Director, Arizona State Occupational Information Coordinating Committee, 1535 West Jefferson, Room 345, Phoenix, Ariz. 85007. Phone: (602) 255–3680.

## Arkansas

Director, Arkansas State Occupational Information Coordinating Committee, P.O. Box 2981, Little Rock, Ark. 72203. Phone: (501) 371–3551.

## California

Executive Director, California Occupational Information Coordinating Committee, 1027 10th Street, No. 302, Sacramento, Calif. 95814. Phone: (916) 323–6544.

## Colorado

Director, Office of Occupational Information, Colorado Occupational Information Coordinating Committee, 213 Centennial Bldg., 1313 Sherman St., Denver, Colo. 80203. Phone: (303) 866–3335.

## Connecticut

Executive Director, Connecticut State Occupational Information Coordinating Committee, c/o Elm Hill School, 569 Maple Hill Avenue, Newington, Conn. 06111. Phone: (203) 666–1441.

## Delaware

Director, State Occupational Information Coordinating Committee of Delaware, Drummond Office Plaza, Suite 3303, Building No. 3, Newark, Del. 19711. Phone: (302) 368–6908.

## District of Columbia

Executive Director, D.C. Occupational Information Coordinating Committee, 500 C St. NW., Suite 621, Washington, D.C. 20001. Phone: (202) 724–3965.

## Florida

Director, Florida Occupational Information Coordinating Committee, 325 John Knox Rd., Suite L–500, Tallahassee, Fla. 32303. Phone: (904) 386–6111.

## Georgia

Executive Director, Georgia Occupational Information Coordinating Committee, 151 Ellis St. NE., Suite 504, Atlanta, Ga. 30303. Phone (404) 656–3117.

## Hawaii

Executive Director, Hawaii State Occupational Information Coordinating Committee, 1164 Bishop St., Suite 502, Honolulu, Hawaii 96813. Phone: (808) 548–3496.

## Idaho

Coordinator, Idaho Occupational Information Coordinating Committee, Len B. Jordan Bldg., Room 301, 650 W. State St., Boise, Idaho 83720. Phone: (208) 334–3705.

## Illinois

Executive Director, Illinois Occupational Information Coordinating Committee, 217 E. Monroe, Suite 203, Springfield, Ill. 62706. Phone: (217) 785–0789.

## Indiana

Director, Indiana Occupational Information Coordinating Committee, 17 W. Market St., 434 Illinois Bldg., Indianapolis, Ind. 46204. Phone: (317) 232–3625.

## Iowa

Executive Director, Iowa State Occupational Information Coordinating Committee, 523 E. 12th St., Des Moines, Iowa 50319. Phone: (515) 281–8076.

## Kansas

Director, Kansas Occupational Information Coordinating Committee, 320 West 7th, Suite D, Topeka, Kans. 66603. Phone: (913) 296–5286.

## Kentucky

Coordinator, Kentucky Occupational Information Coordinating Committee, 275 E. Main St., D.H.R. Bldg., 2nd Floor East, Frankfort, Ky. 40621. Phone: (502) 564–4258.

## Louisiana

Director, Louisiana State Occupational Information Coordinating Committee, P.O. Box 44094, Baton Rouge, La. 70804. Phone: (504) 925–3593.

## Maine

Executive Director, Maine State Occupational Information Coordinating Committee, State House Station 71, Augusta, Maine 04333. Phone: (207) 289–2331.

## Maryland

Executive Director, Maryland Occupational Information Coordinating Committee, Jackson Towers, Suite 304, 1123 N. Eutaw St., Baltimore, Md. 21201. Phone (301) 383–6350.

## Massachusetts

Executive Director, Massachusetts Occupational Information Coordinating Committee, Charles F. Hurley Bldg., Government Center, Boston, Mass. 02114. Phone: (617) 727–9740.

## Michigan

Executive Coordinator, Michigan Occupational Information Coordinating Committee, 309 N. Washington, P.O. Box 30015, Lansing, Mich. 48909. Phone: (517) 373–0363.

## Minnesota

SOICC Director, Department of Economic Security, 690 American Center Bldg., 150 E. Kellogg Blvd., St. Paul, Minn. 55101. Phone: (612) 296–2072.

## Mississippi

SOICC Director, Vocational Technical Education, P.O. Box 771, Jackson, Miss. 39205. Phone: (601) 354–6779.

## Missouri

Director, Missouri Occupational Information Coordinating Committee, 830d E. High St., Jefferson City, Mo. 65101. Phone: (314) 751–2624.

## Montana

Program Manager, Montana State Occupational Information Coordinating Committee, P.O. Box 1728, Helena, Mont. 59624. Phone: (406) 449–2741.

## Nebraska

Executive Director, Nebraska Occupational Information Coordinating Committee, W. 300 Nebraska Hall, Lincoln, Nebr. 68588. Phone: (402) 472–2062.

## Nevada

Director, Nevada Occupational Information Coordinating Committee, Capitol Complex, Kinkead Bldg., Room 601, 505 E. King St., Carson City, Nev. 89710. Phone: (702) 885–4577.

## New Hampshire

SOICC Director, New Hampshire Occupational Information Coordinating Committee, c/o Department of Employment and Training, 155 Manchester St., Concord, N.H. 03301. Phone (603) 271–3156.

## New Jersey

Acting Staff Director, New Jersey Occupational Information Coordinating Committee, Department of Labor and Industry, Division of Planning and Research, P.O. Box CN056, Trenton, N.J. 08625. Phone: (609) 292–2626.

## New Mexico

Director, New Mexico State Occupational Information Coordinating Committee, NEA Building, 130 South Capitol, Suite 157, Santa Fe N.M. 87501. Phone: (505) 827–3411 or 3412.

## New York

SOICC Director, New York Department of Labor, Labor Department Bldg. #12, State Campus, Room 559A, Albany, N.Y. 12240. Phone: (518) 457–2930.

## North Carolina

SOICC Director, North Carolina Department of Administration, 112 W. Lane St., 218 Howard Bldg., Raleigh, N.C. 27611. Phone: (919) 733–6700.

## North Dakota

Director, North Dakota Occupational Information Coordinating Committee, 1424 W. Century Ave., P.O. Box 1537, Bismarck, N. Dak. 58505. Phone: (701) 224–2733.

## Ohio

Director, Ohio Occupational Information Coordinating Committee, State Department Bldg., 65 S. Front St., Room 904, Columbus, Ohio 43215. Phone: (614) 466–2095.



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### Oklahoma

Executive Director, Oklahoma Occupational Information Coordinating Committee, School of Occupational and Adult Education, Oklahoma State University, 1515 W. 6th St., Stillwater, Okla. 74074. Phone: (405) 377–2000, ext. 311.

### Oregon

Coordinator, Oregon Occupational Information Coordinating Committee, 875 Union St., NE., Salem, Oreg. 97311. Phone: (503) 378–8146.

### Pennsylvania

Director, Pennsylvania Occupational Information Coordinating Committee, Labor and Industry Bldg., 7th and Forster Sts., Room 1008, Harrisburg, Pa. 17120. Phone: (717) 787–3467.

### Puerto Rico

Executive Director, Puerto Rico Occupational Information Coordinating Committee, Cond. El Centro II, Suite 224, Munoz Rivera Ave., Hato Rey, P. R. 00918. Phone: (809) 753–7110.

### Rhode Island

Executive Director, Rhode Island Occupational Information Coordinating Committee, 22 Hayes St., Room 315, Providence, R.I. 02908. Phone: (401) 272–0830.

### South Carolina

Director, South Carolina Occupational Information Coordinating Committee, 1550 Gadsden St., Columbia, S.C. 29202. Phone: (803) 758–3165.

### South Dakota

Executive Director, South Dakota Occupational Information Coordinating Committee, 108 E. Missouri, Pierre, S. Dak. 57501. Phone: (605) 773–3935.

### Tennessee

Director, Tennessee Occupational Information Coordinating Committee, 512 Cordell Hull Bldg., Nashville, Tenn. 37219. Phone: (615) 741–6451.

### Texas

Executive Director, Texas Occupational Information Coordinating Committee, Texas Employment Commission Bldg., 15th and Congress, Room 526T, Austin, Tex. 78778. Phone: (512) 397–4970.

### Utah

Director, Utah Occupational Information Coordinating Committee, Elks Club Bldg., Suite 6003, 139 East South Temple, Salt Lake City, Utah 84111. Phone: (801) 533–2028.

### Vermont

Director, Vermont Occupational Information Coordinating Committee, P.O. Box 488, Montpelier, Vt. 05602. Phone: (802) 229–0311.

### Virginia

SOICC Director, Virginia Vocational and Adult Education, Department of Education, P.O. Box 6Q, Richmond, Va. 23216. Phone: (804) 225–2735.

### Washington

SOICC Director, Washington Commission for Vocational Education, Bldg. 17, Airdustrial Park, Mail Stop LS–10, Olympia, Wash. 98504. Phone: (206) 754–1552.

### West Virginia

Executive Director, West Virginia State Occupational Information Coordinating Committee, 1600 1/2 Washington St., E., Charleston, W. Va. 25311. Phone: (304) 348–0061.

### Wisconsin

Director, Wisconsin Occupational Information Coordinating Committee, Educational Sciences Bldg., Room 952, 1025 W. Johnson, Madison, Wis. 53706. Phone: (608) 263–1048.

### Wyoming

Director, Wyoming Occupational Information Coordinating Committee, Hathaway Bldg. — Basement, 2300 Capitol Ave., Cheyenne, Wyo. 82002. Phone: (307) 777–7177 or 7178.

### American Samoa

Executive Director, American Samoa SOICC, Governor's Office, American Samoa Government, Pago Pago, American Samoa 96799.

### Guam

Acting Executive Director, Guam Occupational Information Coordinating Committee, P.O. Box 2817, Agana, Guam 96910. Phone: (617) 477–8941.

### Northern Mariana Islands

Executive Director, Northern Mariana Islands Occupational Information Coordinating Committee, P.O. Box 149, Saipan, Northern Mariana Islands 96950. Phone: 7136.

### Trust Territory of the Pacific

Director, Trust Territory of the Pacific Islands, Occupational Information Coordinating Committee, Office of Planning and Statistics, Saipan, Mariana Islands 96950.

### Virgin Islands

Director, Virgin Islands Occupational Information Coordinating Committee, Department of Education, P.O. Box 630, Charlotte Amalie, St. Thomas, Virgin Islands 00801. Phone: (809) 774–0100, ext. 211.

## Sources of Education and Training Information

As a rule, professional or trade associations can provide lists of schools that offer training in a particular field—operations research, publishing, or arts management, for example. Whenever possible, the Sources of Additional Information section at the end of every *Handbook* statement directs you to organizations that can provide training information. For general information, a library, career center, or guidance office may be the best place to look; all of them ordinarily have collections of catalogs, directories, and guides to educational and job training opportunities. The State career information system available in many States can also provide specific information on where to go for training in various fields. These systems are located in school guidance offices, Job Service offices, and other places. You can find out about the career information system in your State by writing or calling the State occupational information coordinating committee.

A number of standard handbooks give pertinent information on courses of study, admissions requirements, expenses, and student financial aid at the Nation's 2–year and 4–year colleges and universities. Publishers include the College Board, Barrons, and Chronicle Guidance, among others. School and public libraries almost always have copies, as do large bookstores. Remember that these directories are updated and revised frequently; be sure to use the most recent edition. Libraries and guidance offices often have collections of college catalogs as well.

Information on private trade and technical schools is available from the National Association of Trade and Technical Schools (NATTS). Single copies of two of their publications, *Handbook of Trade and Technical Careers and Training* and *How to Choose a Career and a Career School,* can be obtained from NATTS at 2021 K St. NW., Washington, D.C. 20006. Phone: (202) 296–8892.

The National Home Study Council supplies information about home study programs. They distribute *Directory of Accredited Home Study Schools* (free) and *There's a School in Your Mail Box* ($5.00, including postage). Requests for these publications should be directed to National Home Study Council, 1601 18th St. NW., Wahsington, D.C. 20009. Phone: (202) 234–5100.

Labor unions and school guidance offices can provide information about apprenticeships. Local Job Service offices usually have at least one counselor familiar with apprenticeship programs in the area. In some cities, Apprenticeship Information Centers (AIC's) affiliated with the U.S. Employment Service furnish information, counseling, and aptitude testing, and direct people for more specific help to union hiring halls, Joint Apprenticeship Committees, and employer sponsors. The local Job Service can tell you whether there's an AIC in your community. The U.S. Department of Labor's Bureau of Apprenticeship and Training has prepared several pamphlets that provide background information on apprenticeship. These may be requested from: Office of Information, Inquiries Unit, Employment and Training Administration, U.S. Department of Labor, Room 10225, 601 D St. NW., Washington, D.C. 20213. Phone: (202) 376–6730.

## Sources of Financial Aid Information

If possible, consult a high school guidance counselor or college financial aid officer for



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advice on sources of financial aid. Don't neglect any possibility, for many organizations offer scholarships, fellowships, grants, loans, and work–study programs. Study the directories and guides to sources of student financial aid available in guidance offices and public libraries. Many career information systems also provide information on financial aid.

Particularly useful is the American Legion's *Need a Lift?,* a booklet containing career and scholarship information for both undergraduate and graduate students. The 1982 edition costs $1.00 prepaid (includes postage) and can be obtained from: American Legion, Attn: Emblem Sales, P.O. Box 1055, Indianapolis, Ind. 46206.

*Meeting College Costs,* a College Board publication that is updated annually, explains how to apply for student financial aid. High school students should ask their guidance counselors for the current edition. Others can request a free copy, and a listing of other College Board publications on student financial aid, from:
College Board Publication Orders, Box 2815, Princeton, N.J. 08541.

The Federal Government provides several kinds of financial assistance to students: Grants, loans, work–study, and benefits. Information about programs administered by the U.S. Department of Education is presented in a pamphlet entitled, *Five Federal Financial Aid Programs, 1981–82; A Student Consumer's Guide.* This pamphlet is revised every year; request the current edition by calling, toll–free, 800–638–6700 (residents of Maryland should call 800–492–6602), or by writing to:
Bureau of Student Financial Assistance, P.O. Box 84, Washington, D.C. 20044.

Federal financial aid for students in the health professions is administered by the U.S. Department of Health and Human Services. Currently, major programs include Health Education Assistance Loans (HEAL), Health Profession Student Loans, Nursing Student Loans, and National Health Service Corps Scholarships. The financial aid office at the school in which you are enrolled, or plan to enroll, can provide information on eligibility requirements and application procedures. Information about National Health Service Corps Scholarships also can be obtained by calling, toll-free, 1–800–638–0824. Residents of Alaska, Hawaii, and Maryland can call collect, 0–301–436–6453, between 8:30 a.m. and 5:00 p.m. Eastern time, Monday through Friday, except Federal holidays. Persons in the Washington, D.C. metropolitan area can call 436–6450.

Some student aid programs are designed to assist specific groups: Hispanics, blacks, Native Americans, or women, for example. *Selected List of Postsecondary Education Opportunities for Minorities and Women,* published annually by the U.S. Department of Education, is a useful guide to organizations that offer loan, scholarship, and fellowship assistance, with special emphasis on aid for minorities and women. Opportunities for financial aid are listed by field of study, including architecture, arts and science, business, education, engineering and science, health, international affairs, journalism, law, political science and public administration, psychology, sociology, social work, speech pathology and audiology, and theology. Educational opportunities with the Armed Forces are also described. This publication can be found in many libraries and guidance offices, or may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price for the 1981 edition is $6.00 and the GPO stock number is 065–000–00118–7.

## Career and Counseling Information for Special Groups

Certain groups of jobseekers face special difficulties in obtaining suitable and satisfying employment. All too often, veterans, youth, handicapped persons, minorities, and women experience difficulty in the labor market. The reasons for disadvantage in the job market vary, of course. People may have trouble setting career goals and looking for work for reasons as different as a limited command of English, a prison record, or lack of self-confidence. Some people are held back by their background—by growing up in a setting that provided only a few role models and little exposure to the wide range of opportunities in the world of work.

A growing number of communities have career counseling, training, and placement services for people with special needs. Programs are sponsored by a variety of organizations, including churches and synagogues, nonprofit organizations, social service agencies, the Job Service, and vocational rehabilitation agencies. Some of the most successful programs provide the extensive counseling that disadvantaged jobseekers require. They begin by helping clients resolve the personal, family, or other fundamental problems that prevent them from finding a suitable job. Some agencies that serve special groups take a strong interest in their clients, and provide an array of services designed to help people find and keep jobs.

Employment counseling programs of all kinds are included in *Directory of Counseling Services,* an annual publication that lists accredited or provisional members of the International Association of Counseling Services, Inc. (IACS), an affiliate of the American Personnel and Guidance Association. The 1981–82 edition is available for $6 (including postage) from IACS at Two Skyline Place, Suite 400, 5203 Leesburg Pike, Falls Church, Virginia 22041. Phone: (703) 820–4710.

Women's centers are an excellent resource for women seeking employment and counseling on specific problems that women face in the labor market. Many women's centers are located on campuses of community and junior colleges and universities. Although some have a strong academic slant, many have outreach programs designed to provide services to all women in the community. Women's centers are also operated by community organizations. Many of these centers have an emphasis on nontraditional jobs for women, and almost all provide information and referral services.

Most States and many cities and counties have commissions or councils for women, many of which are actively engaged in improving employment opportunities for women in their area. A number of commissions have prepared resource directories for women, and a few operate employment or counseling programs.

Resource materials for women abound. Recent examples include *Directory of Special Opportunities for Women, Job Options for Women in the 80's* and *Suit Yourself . . . Shopping for a Job.* The *Directory* published in 1981 by Garrett Park Press (Garrett Park, Maryland), lists sources of career training, financial aid, and other assistance for women entering or reentering the labor force. Look for it in a library, guidance office, or counseling center. *Job Options,* a 1980 publication of the Women's Bureau of the U.S. Department of Labor, is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The price is $2.25, and the GPO stock number is 029–002–00059–2. *Suit Yourself* was published in 1980 by Wider Opportunities for Women (WOW), a national nonprofit women's employment organization. It can be purchased for $6.00 (includes postage) from WOW, 1619 M St. NW., Washington, D.C. 20036. Phone: (202) 783–5155. *The National Directory of Women's Employment Programs,* also available from WOW, lists 140 women's job action and advocacy organizations in communities throughout the country. Price for the 1979 publication is $8.50, including postage.

*Directory of Special Programs for Minority Group Members: Career Information Services, Employment Skills Banks, Financial Aid Sources* (Garrett Park, Md.: Garrett Park Press), now in its third edition, lists thousands of educational, career, and other services and programs that help minority group members in their educational and career advancement. Look for the 1980 edition in libraries, guidance offices, and counseling centers. Career information for minority group members also appears in specialized magazines including *The Black Collegian* and *Minority Engineer.*

The 1980–81 edition of *Directory of Organizations Interested in the Handicapped* lists more than 150 voluntary and public agencies in the rehabilitation field and briefly describes their purpose, programs, and publications. Copies of the *Directory* may be obtained from



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the People to People Committee for the Handicapped, 1111 20th St. NW., 6th floor, Washington, D.C. 20210. Phone: (202) 653–5024. State vocational rehabilitation agencies are an important source of career and counseling information for people with disabilities; they are listed in the *Directory*.

Employment counseling and placement services for older workers have been established in some communities. The area agency on aging can tell you whether there is a senior employment program in your community. Local offices of the State employment service may be helpful, too. Information about the small but growing network of nonprofit senior employment agencies can be obtained from the National Association of Older Worker Employment Services, 600 Maryland Ave. SW., West Wing 100, Washington, D.C. 20024. Phone: (202) 479–1200. Case studies describing the operations of specific agencies are available from the National Clearinghouse on Careers for Older Americans, Academy for Educational Development, 680 Fifth Avenue, New York, N.Y. 10019. Phone: (212) 397–0073.

Several agencies of the Federal Government publish pamphlets on career opportunities and job-hunting techniques that may interest counselors working with special groups. Much of this material is free. Requests for career materials currently in stock may be directed to:

### Handicapped

President's Committee on Employment of the Handicapped, Room 600, Vanguard Building, 1111 20th St. NW., Washington, D.C. 20036. Phone: (202) 653–5157.

President's Committee on Mental Retardation, Washington, D.C. 20201.

Rehabilitation Services Administration, U.S. Department of Education, Room 3523, 330 C St. SW., Washington, D.C. 20202.

Office of Personnel Management, Federal Job Information Center, P.O. Box 52, Washington, D.C. 20044. Phone: (202) 737–9616.

### Older Workers

Office of Information, Inquiries Unit, Employment and Training Administration, U.S. Department of Labor, Room 10225, 601 D St. NW., Washington, D.C. 20213. Phone: (202) 376–6730.

### Women

Women's Bureau, U.S. Department of Labor, Room S-3005, 200 Constitution Ave. NW., Washington, D.C. 20210. Phone: (202) 523–6668.

### Veterans

Office of Information, Inquiries Unit, Employment and Training Administration, U.S. Department of Labor, Room 10225, 601 D St. NW., Washington, D.C. 20213. Phone: (202) 376–6730.

Office of Personnel Management, Federal Job Information Center, P.O. Box 52, Washington, D.C. 20044. Phone: (202) 737–9616.

Department of Veterans Benefits (232A), Veterans Administration Central Office, 810 Vermont Ave. NW., Washington, D.C. 20420. Phone: (202) 389–3227.

Federal laws, Executive Orders, and selected Federal grant programs bar discrimination in employment based on race, color, religion, sex, national origin, age, and handicap. Employers in the private and the public sectors, Federal contractors, and grantees are covered by these laws. The U.S. Equal Employment Opportunity Commission (EEOC) is responsible for administering many of the programs that prohibit discrimination in employment. Information about how to file a charge of discrimination is available from local EEOC offices around the country (their addresses and telephone numbers are listed in telephone directories under U.S. Government, EEOC) or from:

Equal Employment Opportunity Commission, 2401 E St. NW., Washington, D.C. 20506. Phone: (202) 634–6930.

Information on Federal laws concerning fair labor standards—including the minimum wage law—and equal employment opportunity can be obtained from the Office of Information and Consumer Affairs, Employment Standards Administration, U.S. Department of Labor, Room C–4331, 200 Constitution Ave. NW., Washington, D.C. 20210.

## Information on Finding a Job

Do you need help in finding a job? For information on job openings, follow up as many leads as possible. Parents, neighbors, teachers, and counselors may know of jobs. Check the want ads. Investigate your local Job Service office and find out whether private or nonprofit employment agencies in your community can help you. The following section will give you some idea of where you can go to look for a job and what sort of help to expect.

**Informal job search methods.** Informal methods of job search are the most popular, and also the most effective. Informal methods include direct application to employers with or without referral by friends or relatives. Jobseekers locate a potential employer and file an application, often without certain knowledge that an opening exists.

You can find targets for your informal search in several ways. The *Yellow Pages* and local chambers of commerce will give the names and addresses of appropriate firms in the community where you wish to work. You can also get listings of most firms in a specific industry—banking, insurance, and newspaper publishing, for example—by consulting one of the directories on the reference shelf of your public library. Friends, relatives, and people you meet during your job search are likely to give you ideas about places where you can apply for a job.

**Want ads.** The "Help Wanted" ads in a major newspaper contain hundreds of job listings. As a job search tool, they have two advantages: They are cheap and easy to acquire, and they often result in successful placement. There are disadvantages as well. Want ads give a distorted view of the local labor market, for they tend to underrepresent small firms. They also tend to overrepresent certain occupations, such as clerical and sales jobs. How helpful they are will depend largely on the kind of job you seek.

Bear in mind that want ads do not provide complete information; many give little or no description of the job, working conditions, and pay. Some omit the identity of the employer. In addition, firms often run multiple listings. Some ads offer jobs in other cities (which do not help the local worker); others advertise employment agencies rather then employment.

If you use the want ads, keep the following suggestions in mind:

—Don't rely exclusively on the want ads; follow up other leads, too.

—Answer ads promptly. The opening may be filled before the ad stops running.

—Follow the ads diligently. Checking them every day as early as possible gives you the best advantage over other applicants, which may mean the difference between a job and a rejection.

—Don't expect too much from "blind ads" that do not reveal the employer's identity. Employers use blind ads to avoid being swamped with applicants, or to fill a particular vacancy quietly and confidentially. The chances of finding a job through blind ads tend to be slim.

—Be cautious about answering "no experience necessary" ads. Most employers are able to fill job openings that do not require experience without advertising in the newspaper. This type of ad may mean that the job is hard to fill because of low wages or poor working conditions, or because it is straight commission work.

**Public employment service.** The public employment service, also called the Job Service, is often overlooked in finding out about local job openings. Run by the State employment security agencies under the direction of the Labor Department's U.S. Employment Service, the 2,500 local Job Service offices provide help without charge. Job Service staff help jobseekers find employment and help employers find qualified workers. As its motto says, the Job Service aims to "bring people to jobs and jobs to people." To find the office nearest you, look in the State government telephone listings under "Job Service" or "Employment."

*Job matching and referral.* Upon entering a Job Service center, an applicant is interviewed to determine the type of work for which he or she indicates an interest and aptitude. The interviewer determines if the applicant is "job ready" or if counseling and testing services are



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needed. Applicants who know what kind of work they are qualified for may spend some time examining the Job Bank, a computerized listing of public and private sector job openings that is updated every day. The Job Bank is self-service; applicants examine a book or microfilm viewer and select openings that interest them. Afterwards, a Job Service staff member may describe a particular job opening in some detail and arrange for an interview with the prospective employer.

*Counseling and testing.* Job Service centers also help jobseekers who are uncertain about their qualifications and the kind of work they want. Most centers are staffed with a specialist who furnishes complete counseling and testing services. Counselors help jobseekers choose and prepare for an occupation based on their qualifications and interests. They aim to help individuals become aware of their job potential and then develop it. The testing program measures occupational aptitudes, clerical and literary skills, and occupational interests. Testing and counseling before job referral ensure a better match between applicant and job.

*Services for veterans and youth.* By law, veterans are entitled to priority in interviewing, counseling, testing, job development, and job placement. Special counselors called veterans reemployment representatives are trained to deal with the particular problems of veterans, who may find it difficult to readjust to civilian life. Although such veterans often face multiple problems, joblessness alone is a major barrier to resuming an ordinary life. Special help for disabled veterans begins with outreach units in each State, whose job it is to identify jobless disabled veterans and make them aware of the many kinds of assistance available.

To reduce excessive youth unemployment, Job Service centers test, counsel and refer young people to training programs or jobs whenever possible.

*Occupations in Demand.* A monthly publication of the U.S. Department of Labor entitled *Occupations in Demand* highlights occupations for which the Job Bank network reports large numbers of job openings. It also indicates which cities and areas have significant numbers of job openings. An extra edition for students and graduates, published twice a year, lists high-demand occupations for which employers usually request people with high school or postsecondary training. The extra edition also identifies hard-to-fill occupations listed with the Job Service. Copies of *Occupations in Demand* may be found in libraries and counseling centers. Or you can request single free copies from:

Consumer Information Center, Dept. No. 533J, Pueblo, Colorado 81009.

Annual subscriptions cost $18.00 and can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

**Private employment agencies.** In the appropriate section of the classified ads or the telephone book you can find numerous advertisements for private employment agencies. All are in business to make money, but some offer higher quality service and better chances of successful placement than others.

The three main places in which private agencies advertise are newspaper want ads, the *Yellow Pages,* and trade journals. Telephone listings give little more than the name, address, phone number, and specialty of the agency, while trade journals generally advertise openings for a particular occupation, such as accountant or computer programmer. Want ads, then, are the best source of general listings of agencies.

These listings fall into two categories—those offering specific openings and those offering general promise of employment. You should concentrate on the former and use the latter only as a last resort. With a specific opening mentioned in the ad, you have greater assurance of the agency's desire to place qualified individuals in suitable jobs.

When responding to such an ad, you may learn more about the job over the phone. If you are interested, visit the agency, fill out an application, present a resume, and talk with an interviewer. The agency will then arrange an interview with the employer if you are qualified, and perhaps suggest alternative openings if you are not.

Most agencies operate on a commission basis, with the fee contingent upon a successful match. The employer pays agencies advertising "no fees, no contracts" and the applicant pays nothing. Many agencies, however, do charge applicants. You should find out the exact cost before using the service.

**Community agencies.** A growing number of nonprofit organizations throughout the Nation provide counseling, career development, and job placement services. These agencies generally concentrate on services for a particular labor force group—women, youth, minorities, ex-offenders, or older workers, for example. Some of these agencies are listed in directories already mentioned in the section on Career and Counseling Information for Special Groups.

It's up to you to discover whether your community has such agencies and whether they can help you. The local Job Service center should be able to tell you whether such an agency has been established in your community. Your church, synagogue, or local library may have the information, too.

**College career planning and placement offices.** For those who have access to them, career planning and placement offices at colleges and universities offer valuable services. College placement offices function as more than just employment agencies; they provide career counseling and also teach students to acquire jobseeking skills. They emphasize writing resumes and letters of application, preparing for interviews, and other aspects of job search. College placement offices offer other services, too. At larger campuses they bring students and employers together by providing schedules and facilities for interviews with industry recruiters. Many offices also maintain lists of local part-time and temporary jobs, and some have files of summer openings.

## Labor Market Information

All 50 States, and the District of Columbia, develop detailed information about the labor market. Typically, State agencies publish reports that deal with future occupational supply, characteristics of the work force, changes in State and area economic activities, and the employment structure of important industries. For all States, and for nearly all Standard Metropolitan Statistical Areas (SMSA's) of 50,000 inhabitants or more, data are available that show current employment as well as estimated future needs. Each State issues a report covering current and future employment for hundreds of industries and occupations. In addition, major statistical indicators of labor market activity are released by all of the States on a monthly, quarterly, and annual basis. For information on the various labor market studies, reports, and analyses available in a specific State, contact the chief of research and analysis in the State employment security agency. Titles, addresses, and telephone numbers are as follows:

### Alabama

Chief, Research and Statistics, Department of Industrial Relations, Industrial Relations Bldg., 649 Monroe St., Montgomery, Ala. 36130. Phone: (205) 832–5263.

### Alaska

Chief, Research and Analysis, Employment Security Division, Department of Labor, P.O. Box 3–7000, Juneau, Alaska 99802. Phone: (907) 465–4505.

### Arizona

Chief, Labor Market Information, Research and Analysis, Department of Economic Security, P.O. Box 6123, Phoenix, Ariz. 85005. Phone: (602) 255–3616.

### Arkansas

Chief, Research and Analysis, Employment Security Division, P.O. Box 2981, Little Rock, Ark. 72203. Phone: (501) 371–1541.

### California

Chief, Employment Data and Research Division, Employment Development Department, P.O. Box 1679, Sacramento, Calif. 95808. Phone: (916) 445–4434.


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## Colorado

Chief, Research and Development, Division of Employment and Training, Department of Labor and Employment, 1278 Lincoln St., Denver, Colo. 80203. Phone: (303) 866–6316.

## Connecticut

Director, Research and Information, Employment Security Division, 200 Folly Brook Blvd., Hartford, Conn. 06115. Phone: (203) 566–2120.

## Delaware

Chief, Office of Planning, Research and Evaluation, Department of Labor, Bldg. D., Chapman Rd., Route 273, Newark, Del. 19713. Phone: (302) 368–6962.

## District of Columbia

Chief, Labor Market Information, Research and Analysis, D.C. Department of Labor, 605 G St. NW., Room 1000, Washington, D.C. 20001. Phone: (202) 724–2413.

## Florida

Chief, Research and Analysis, Florida Department of Labor and Employment Security, Caldwell Bldg., Tallahassee, Fla. 32301. Phone: (904) 488–6037.

## Georgia

Director, Labor Information Systems, Employment Security Agency, Department of Labor, 254 Washington St. SW., Atlanta, Ga. 30334. Phone: (404) 656–3177.

## Hawaii

Chief, Research and Statistics, Department of Labor and Industrial Relations, P.O. Box 3680, Honolulu, Hawaii 96811. Phone: (808) 548–7639.

## Idaho

Chief, Research and Analysis, Department of Employment, P.O. Box 35, Boise, Idaho 83707. Phone: (208) 384–2755.

## Illinois

Manager, Research and Analysis Division, Bureau of Employment Security, Department of Labor, 910 S. Michigan Ave., Chicago, Ill. 60605. Phone: (312) 793–2316.

## Indiana

Chief of Research, Employment Security Division, 10 N. Senate Ave., Indianapolis, Ind. 46204. Phone: (317) 232–7702.

## Iowa

Chief, Research and Analysis, Department of Job Service, 1000 E. Grand Ave., Des Moines, Iowa 50319. Phone: (515) 281–8181.

## Kansas

Chief, Research and Analysis, Division of Employment, Department of Human Resources, 401 Topeka Ave., Topeka, Kans. 66603. Phone: (913) 296–5060.

## Kentucky

Chief, Research and Statistics, Department of Human Resources, 275 E. Main St., Frankfort, Ky. 40621. Phone: (502) 564–7976.

## Louisiana

Chief, Research and Statistics, Department of Employment Security, P.O. Box 44094, Baton Rouge, La. 70804. Phone: (504) 342–3141.

## Maine

Director, Manpower Research Division, Employment Security Commission, 20 Union St., Augusta, Maine 04330. Phone: (207) 289–2271.

## Maryland

Director, Research and Analysis, Department of Human Resources, 1100 N. Eutaw St., Baltimore, Md. 21201. Phone: (301) 383–5000.

## Massachusetts

Director, Job Market Research, Division of Employment Security, Hurley Bldg., Government Center, Boston, Mass. 02114. Phone: (617) 727–6556.

## Michigan

Director, Research and Statistics Division, Employment Security Commission, 7310 Woodward Ave., Detroit, Mich. 48202. Phone: (313) 876–5445.

## Minnesota

Director, Research and Statistical Services, Department of Economic Security, 390 N. Robert St., St. Paul, Minn. 55101. Phone: (612) 296–6545.

## Mississippi

Chief, Research and Statistics Division, Employment Security Commission, P.O. Box 1699, Jackson, Miss. 39205. Phone: (601) 961–7424.

## Missouri

Chief, Research and Statistics, Division of Employment Security, Department of Labor and Industrial Relations, P.O. Box 59, Jefferson City, Mo. 65101. Phone: (314) 751–3215.

## Montana

Chief, Reports and Analysis, Employment Security Division, P.O. Box 1728, Helena, Mont. 59601. Phone: (406) 449–2430.

## Nebraska

Chief, Research and Statistics, Division of Employment, Department of Labor, P.O. Box 94600, Lincoln, Nebr. 68509. Phone: (402) 475–8451.

## Nevada

Chief, Employment Security Research, Employment Security Department, 500 E. Third St., Carson City, Nev. 89713. Phone: (702) 885–4550.

## New Hampshire

Director, Economic Analysis and Reports, Department of Employment Security, 32 S. Main St., Concord, N.H. 03301. Phone: (603) 224–3311, ext. 251.

## New Jersey

Director, Division of Planning and Research, Department of Labor and Industry, P.O. Box 2765, Trenton, N.J. 08625. Phone: (609) 292–2643.

## New Mexico

Chief, Research and Statistics, Employment Services Division, P.O. Box 1928, Albuquerque, N. Mex. 87103. Phone: (505) 842–3105.

## New York

Director, Division of Research and Statistics, Department of Labor, State Campus, Bldg. 12, Albany, N.Y. 12240. Phone: (518) 457–6181.

## North Carolina

Director, Bureau of Employment Security Research Employment Security Commission, P.O. Box 25903, Raleigh, N.C. 27611. Phone: (919) 733–2936.

## North Dakota

Chief, Research and Statistics, Employment Security Bureau, P.O. Box 1537, Bismarck, N.Dak. 58505. Phone: (701) 224–2868.

## Ohio

Director, Division of Research and Statistics, Bureau of Employment Services, 145 S. Front St., Columbus, Ohio 43216. Phone: (614) 466–3240.

## Oklahoma

Chief, Research and Planning Division, Employment Security Commission, 310 Will Rogers Memorial Office Bldg., Oklahoma City, Okla. 73105. Phone: (405) 521–3735.

## Oregon

Assistant Administrator, Research and Statistics, Employment Division, 875 Union St. NE., Salem, Oreg. 97311. Phone: (503) 378–3220.

## Pennsylvania

Director, Research and Statistics, Bureau of Employment Security, Department of Labor and Industry, 7th and Forster Sts., Harrisburg, Pa. 17121. Phone: (717) 787–3265.

## Puerto Rico

Chief, Research and Statistics, Bureau of Employment Security, 505 Munoz Rivera Ave., Hato Rey, P.R. 00918. Phone: (809) 754–5385.

## Rhode Island

Supervisor, Employment Security Research, Department of Employment Security, 24 Mason St., Providence, R.I. 02903. Phone: (401) 277–3704.

## South Carolina

Director, Manpower Research and Analysis, Employment Security Commission, P.O. Box 995, Columbia, S.C. 29202. Phone: (803) 758–8983.

## South Dakota

Chief, Research and Statistics, Office of Administrative Services, Department of Labor, P.O. Box 1730, Aberdeen, S. Dak. 57401. Phone: (605) 622–2314.



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## Tennessee

Chief, Research and Statistics, Department of Employment Security, Cordell Hull Office Bldg., Room 519, Nashville, Tenn. 37219. Phone: (615) 741–2284.

## Texas

Chief, Economic Research and Analysis, Employment Commission, 1117 Trinity St., Austin, Tex. 78701. Phone: (512) 397–4540.

## Utah

Director, Research and Analysis, Department of Employment Security, P.O. Box 11249, Salt Lake City, Utah 84147. Phone: (801) 533–2014.

## Vermont

Chief, Research and Statistics, Department of Employment Security, P.O. Box 488, Montpelier, Vt. 05602. Phone: (802) 229–0311.

## Virginia

Commissioner, Virginia Employment Commission, P.O. Box 1358, Richmond, Va. 23211. Phone: (804) 786–3001.

## Washington

Chief, Research and Statistics, Employment Security Department, 212 Maple Park, Olympia, Wash. 98504. Phone: (206) 753–5224.

## West Virginia

Chief, Labor and Economic Research, Department of Employment Security, 112 California Ave., Charleston, W. Va. 25305. Phone: (304) 885–2660.

## Wisconsin

Director, Research and Statistics, Department of Industry, Labor and Human Relations, P.O. Box 7944, Madison, Wis. 53707. Phone: (608) 266–7034.

## Wyoming

Chief, Reports and Analysis, Employment Security Commission, P.O. Box 2760, Casper, Wyo. 82601. Phone: (307) 237–3703.



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# Tomorrow's Jobs

Constant change is one of the most significant aspects of the U.S. job market. Changes in the size, age structure, and geographic location of the population, the introduction of new technology or business practices, and changes in the needs and tastes of the public continually alter the economy and affect employment opportunities in all occupations. Population growth has spurred the need for workers to provide more housing, medical care, education, and other services and goods. The use of new technology has created, eliminated, or changed the nature of hundreds of thousands of jobs. The computer, for example, has given birth to an entire new group of occupations—programmers, systems analysts, computer and peripheral equipment operators—while at the same time it has decreased the need for inventory clerks, bookkeepers, and other clerical works. Changes in the way businesses are organized and managed have had similar effects. For example, the use of centralized credit offices has reduced the need for credit managers in retail stores.

As an individual planning for a career, you should learn about changes that are expected to occur in the job market. Your interests and abilities determine the occupation that attracts you, but future economic and social conditions will determine possible job opportunities. Fortunately, most changes that alter the demand for workers in various occupations generally occur gradually over several years. By analyzing the changing nature of the economy and the factors causing these changes it is possible to project future industry and occupational employment. Although no one can forecast the future with certainty, these employment projections can help you learn about future opportunities in occupations that interest you.

The *Handbook* presents information about the job outlook for many occupations. This chapter provides a background for those discussions. In it you will find information about expected changes in the population and the labor force, as well as employment projections for major industrial sectors and broad occupational groups.

## Population

Changes in population are among the basic factors that will affect employment opportunities in the future. The demand for workers in any occupation depends ultimately on the goods and services sought by the public. Changes in the size and characteristics of the population influence the amount and types of goods and services demanded. Changes in population also affect the size and characteristics of the labor force—the people who work or are available to work—which in turn can influence the amount of competition for jobs in an occupation. Three population factors that will affect future employment opportunities are population growth, shifts in the age structure of the population, and movement of the population within the country.

*Population Growth.* The population of the United States has increased throughout the century. However, the rate of growth (the size of the annual increases) was declining until the post-World War II "baby boom," which lasted until the late 1950's. Since the 1960's, the rate of growth has declined again (chart 1).

In 1980, the population was 226.5 million. It is expected to increase by about 0.9 percent a year during the 1980's, slightly faster than during the 1970's. Continued growth will mean more people to provide with goods and services, causing greater demand for workers in many industries. The effects of population growth on employment in various occupations will differ. These differences are accounted for in part by the age distribution of the future population.

*Age Structure.* Because of the "baby boom," the proportion of people age 14 to 24 was high in the 1970's. Through the 1980's, as these young adults become older, the proportion of the population between the ages of 25 and 44 will swell. By 1990, nearly one-third of the population will be in this age group compared to 24 percent in 1970. As a result of the relatively low number of births during the 1960's and early 1970's, the number of people between the ages of 14 and 24 will decline in the coming decade. The number of people 65 and over will grow, but more slowly than in recent years. These changes in the age structure of the population will directly affect the types of goods and services demanded. For example, as the number of young people declines, the need for some education services will fall. When greater numbers of people from the baby boom establish families, they will require more housing and goods such as appliances.

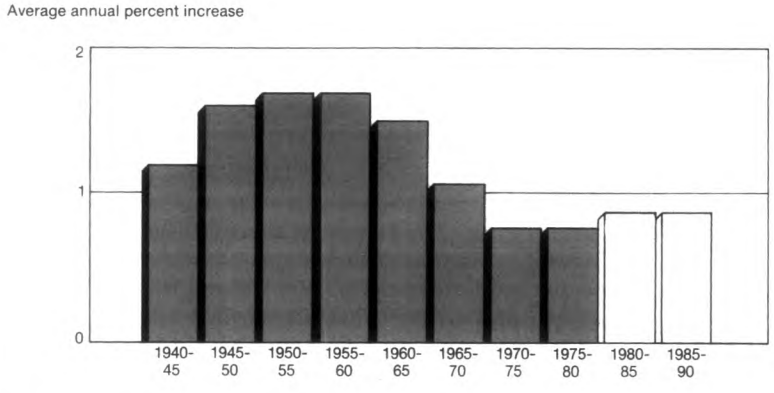
Shifts in the age structure of the population also will affect the composition of the labor force. These effects are discussed in a later section.

*Regional Differences.* National trends in population may not be the same as changes in a particular region or locality. A nation as large the United States is bound to vary from one place to another in rate of population growth. For example, between 1970 and 1980, the population of the Northeast and North Central regions increased by 0.2 percent and 4.0 percent, respectively, compared with 20.0 percent for the South and 23.9 percent in the West (chart 2). These differences in population growth reflect the movement of people to find new jobs, to retire, or for some other reason.

Geographic shifts in the population alter the demand for and supply of workers in local job markets. In areas with a growing population, for example, demand for services such as police and fire protection, water, and sanitation will increase. At the same time, in some occu-

Chart 1

**Since 1960, the population has grown more slowly**




Source: Bureau of the Census



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pations more people looking for work in those areas could increase competition. Individuals investigating future employment opportunities in an occupation should remember that local conditions could differ greatly from national projections presented in the *Handbook*. Sources of information about local job market conditions can be found in the section, "Where to Go for More Information."

## Labor Force

The size and characteristics of the labor force determine the number and type of people competing for jobs. In addition, because workers are a vital part of the production process, the size of the labor force affects the amount of goods and services that can be produced. Growth, alterations in the age structure, and rising educational levels are among the labor force changes that will affect employment opportunities through the 1980's.

*Growth*. The civilian labor force consists of people with jobs and people looking for jobs. Through the late 1960's and the 1970's, the number of people in the labor force grew tremendously because many people born during the baby boom entered the job market, and women increasingly sought jobs. In 1980, the civilian labor force totaled about 105 million persons—63 percent of the noninstitutional population 16 years of age and over.

The labor force will continue to grow during the 1980's but at a slower rate than in recent years. By 1990, the size of the labor force is expected to range from 122 to 128 million persons—a projected increase of 17 to 22 percent over the 1980 level. Contributing to this anticipated growth will be the expansion of the working age population and the continued rise in the proportion of women who work. The labor force will grow more slowly between 1985 and 1990 than in the early 1980's. This slowdown will result from a drop in the number of young people of working age despite continued growth in the participation rate of women (charts 3 and 4). A larger labor force will mean more people looking for jobs. However, because of shifts in the age structure, the employment outlook for many individuals will improve.

*Age Structure*. As a result of the baby boom, a large number of young people entered the labor force during the 1970's, increasing competition for many entry level jobs. As the number of people between 16 and 24 drops, there will be fewer first-time entrants into the labor force, and competition for entry level jobs should ease. The proportion of 25- to 54-year-olds in the labor force will swell as people born during the baby boom get older. The whole economy should benefit from this change because workers in this age group generally have work experience and are, therefore, more productive and less likely to be unemployed (chart 5).

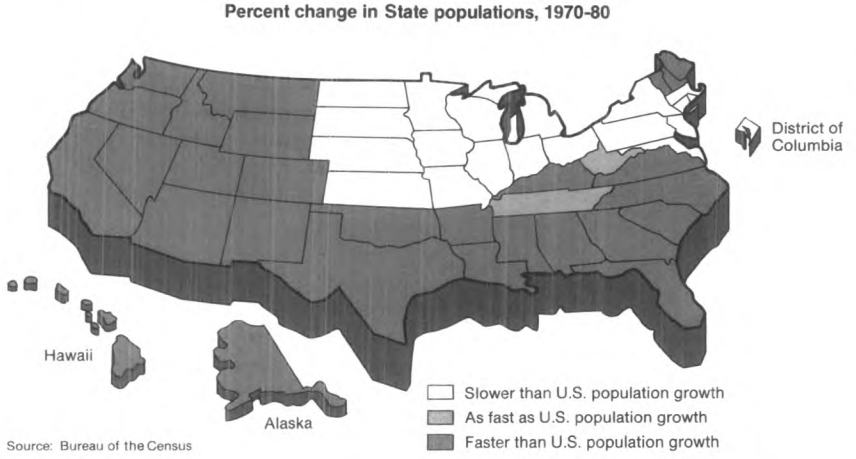
*Education*. Employers always wish to hire the best qualified persons available at the offered wage. This does not mean that they always choose those applicants who have the most education. However, individuals looking for a job should be aware that the higher educational attainment of the labor force as a whole could increase competition in many occupations.

Persons contemplating dropping out of high school should recognize that a high school education has become standard. The educational attainment of the labor force has risen from 11.1 years of school in 1952 to 12.7 years in 1980. Many technical, craft, and office occupations now require postsecondary vocational education or apprenticeship, because employers prefer to hire trained applicants rather than provide training. Thus, high school dropouts are likely to be at a serious disadvantage when seeking jobs that offer better pay or advancement.

Traditionally, a college education has been viewed as a gateway to better pay, higher status, and more challenging work. As college education has become more widespread, the proportion of workers in the labor force who have completed at least 4 years of college has risen from 8 percent in 1952 to 19 percent in 1980. Recent experience has shown, however, that the traditional view of a college degree as a guarantee of success has not been matched by reality. Between 1970 and 1980, employment of college graduates grew 84 percent. The proportion employed in professional, technical, and managerial occupations, however, declined because these occupations did not expand rapidly enough to absorb the growing supply of graduates. As a result, 1 out of 4 college graduates who entered the labor market between 1969 and 1978 took jobs not usually considered by graduates to be appropriate to their education and abilities. The proportion of graduates in clerical, lower level sales, and

Chart 2

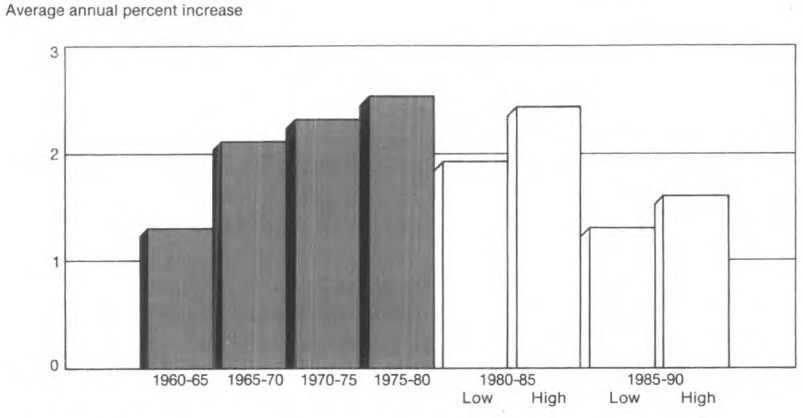
**Population growth varies among the States**




Source: Bureau of the Census

Chart 3

**Labor force growth will slow during the 1980's**




Source: Bureau of Labor Statistics



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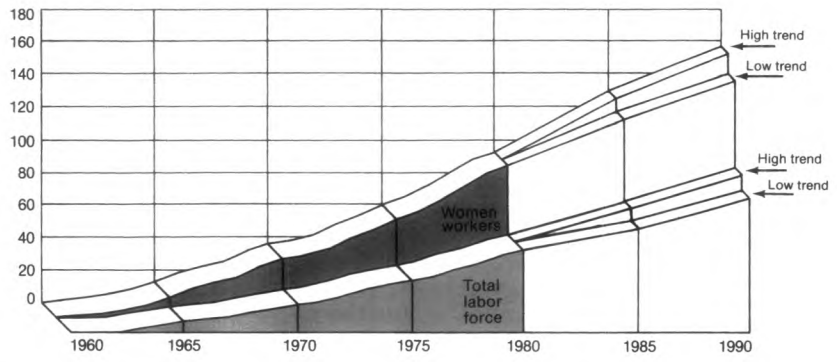
Chart 4

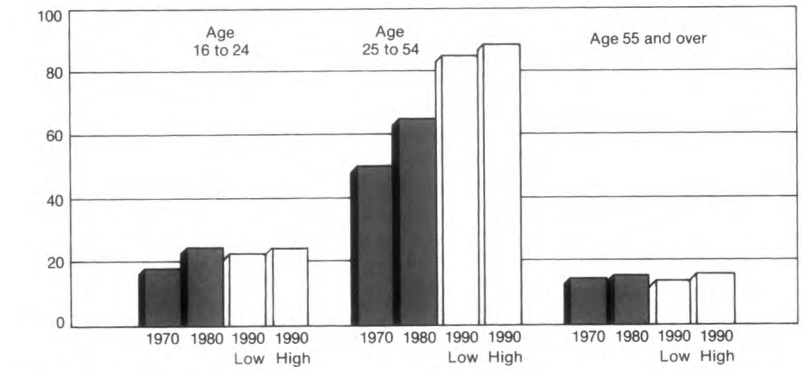
**The number of women workers will continue to grow faster than the total labor force**




Source: Bureau of Labor Statistics

Chart 5

**Through the 1980's, the number of workers in the prime working ages will grow dramatically**




Source: Bureau of Labor Statistics

blue-collar occupations grew.

Analysis of the future demand for college graduates, and of future supply, indicates that more college graduates will be available than will be needed to fill jobs that require a college degree. Not all occupations requiring a college degree will be overcrowded, however. Systems analysts, programmers, and engineers are examples of occupations where college graduates are expected to be in very strong demand.

But despite widespread publicity about the overall poor job market for college graduates, graduates still have an advantage over other workers. They are more likely to be employed and to hold the highest paying professional and managerial jobs. Persons interested in occupations that require a college degree should not be discouraged from pursuing a career that they believe matches their interests and abilities, but they should be aware of job market conditions.

## Employment

The previous sections discussed trends in the population and the labor force—two factors that affect employment opportunities. Others factors include the policies of the Federal Government, the rate of inflation, and the availability of energy. Changes in these and related factors affect the amount and type of goods and services that will be demanded in the future. If the demand for an industry's output increases in the future, more workers generally will be hired to increase production, and employment in the industry will grow. Growth in an occupation is closely related to the growth rates of industries in which the occupation is found. For example, growth in the construction industry would result in an increase in employment of blue-collar workers, as would growth in mining, manufacturing, or transportation—industries that also employ a high proportion of blue-collar workers. Likewise, growth in finance, insurance, and real estate would result in an increase in demand for white-collar workers (chart 6).

The Bureau of Labor Statistics has prepared three sets of projections of employment in industries and occupations. Referred to as the low-trend, high-trend I, and high-trend II alternatives or scenarios, the projections are based on different assumptions concerning growth of the labor force, unemployment, output, productivity, and other factors. The low-trend projection assumes a decline in the rate of labor force growth, moderately high employment levels throughout the decade, continued high inflation, and modest increases in production and productivity. The two high-trend scenarios are more optimistic, assuming a slowdown of inflation, and lower unemployment rates than the low-trend scenario. The high-trend I scenario assumes a faster growth of the labor force but slower growth of productivity than the high-trend II scenario. A more detailed discussion of the assumptions and methods used to develop the three sets of projections can be found in a separate chapter of the *Handbook*.

The following sections present employment estimates from the low-trend and the higher of the high-trend scenarios. Together these two estimates define the range of the projected industry and occupational employment growth.

## Industrial Profile

To discuss employment trends and projections in industries, it is useful to divide the economy into nine industrial sectors under two broad groups—service-producing industries and goods-producing industries. Over two-thirds of the Nation's workers currently are employed in industries that provide services such as health care, trade, education, repair and maintenance, government, transportation, banking, and insurance. Industries that produce goods through farming, construction, mining, and manufacturing employ less than one-third of the country's work force.

**Service-Producing-Industries.** Employment in service-producing industries has increased at a faster rate than employment in goods-producing industries (chart 7). Among the factors that have contributed to this rapid growth are rising incomes and living standards that result in greater demand for education, health care, entertainment, and business and financial services. In addition, the growth of cities and suburbs brought a need for more local government services. Further, because many services involve personal contact, fewer people have been replaced by machines in service-producing industries.

Employment in service-producing industries is expected to increase from 65.7 million workers in 1980 to between 78.7 and 83.5 million in 1990, or by 20 to 27 percent. Growth will vary among industries within the group (chart 8). The following paragraphs summarize recent trends and the projections of em-



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ployment in the five industrial sectors that make up the service-producing industries.

*Transportation, communications, and public utilities.* This is the slowest growing sector of the service-producing industries. Between 1970 to 1980, employment in this sector increased only one-third as fast as in the service-producing industries as a whole, due largely to declining employment requirements in the railroad and water transportation industries. However, even in the communications industries where demand increased greatly, technological innovations limited employment growth.

Between 1980 and 1990, employment in the transportation, communication, and public utilities sector is expected to rise from 5.5 million to between 6.5 and 7.1 million workers, or by 12 to 22 percent. Communications industries will grow 14 to 27 percent, from 1.4 million to between 1.5 and 1.7 million workers. More efficient communications equipment is likely to keep employment from growing as rapidly as output.

Although employment in railroad and water transportation industries is expected to decline, other transportation industries such as air, local transit, and trucking will increase. Employment in transportation as a whole will rise by 12 to 18 percent, from 3.6 million to between 4.1 and 4.3 million workers.

Demand for electric power, gas utilities, and water and sanitary services will increase through the 1990's as population and industry grow. Employment in industries that deliver these services is expected to increase from 834,000 to between 910,000 and 1.1 million workers, or by 9 to 30 percent.

*Trade.* Both wholesale and retail trade employment have increased as the population has grown and as rising incomes have enabled people to buy a great number and variety of goods. Retail trade grew slightly faster than wholesale trade during the 1970's, 38 percent compared to 32 percent—reflecting the growth of shopping centers as the suburbs expanded. Between 1980 and 1990, wholesale and retail trade employment is expected to grow from 20.6 million to between 25.1 and 26.8 million workers, or by 22 to 31 percent. Employment will continue to increase faster in retail than in wholesale trade, 24 to 31 percent compared with 17 to 28 percent. Employment will rise despite the use of some laborsaving innovations such as self-service merchandising and computerized inventory systems.

*Finance, insurance, and real estate.* This sector grew 42 percent between 1970 and 1980 as these industries expanded to meet the financial and banking needs of a growing population.

Between 1980 and 1990, employment in this section is expected to rise from 5.2 million to between 6.5 and 6.9 million workers, or by 26 to 34 percent. A growing population will keep demand high for credit and other financial services. In addition, businesses will need assistance to finance the expansion of their plants and the purchase of new equipment.

*Services.* This sector includes a variety of industries, such as hotels, barber shops, automobile repair shops, business services, hospitals, and nonprofit organizations. Employment in this sector increased 37 percent between 1970 and 1980. High demand for health care, maintenance and repair, advertising, and commercial cleaning services has been among the forces behind this growth.

From 1980 to 1990, employment in service industries is expected to increase from 26.2 million to between 31.6 and 33.5 million workers or by 20 to 28 percent, and will provide more new jobs than any other industry sector. Employment requirements in health care are expected to grow rapidly due to population growth—particularly the elderly—rising incomes and increased health insurance coverage that increase people's ability to pay for medical care. Business services, including accounting, data processing, and maintenance, also are expected to grow rapidly.

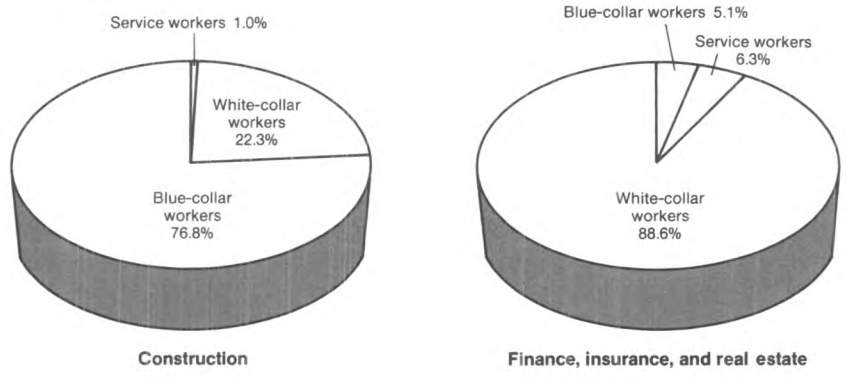
*Government.* Increase demand for services provided by government—administration, health and welfare and police and fire protection—caused employment in the government sector to rise about 36 percent between 1970 and 1980. Employment in State and local governments expanded 47 percent compared to 13 percent for the Federal Government.

As a result of public desire to limit government growth, employment is expected to rise only 14 to 16 percent, from 7.9 million to between 9 and 9.1 million workers. Most of this growth will be in State and local government.

**Goods-Producing Industries.** Employment in goods-producing industries rose only 10 per-

Chart 6

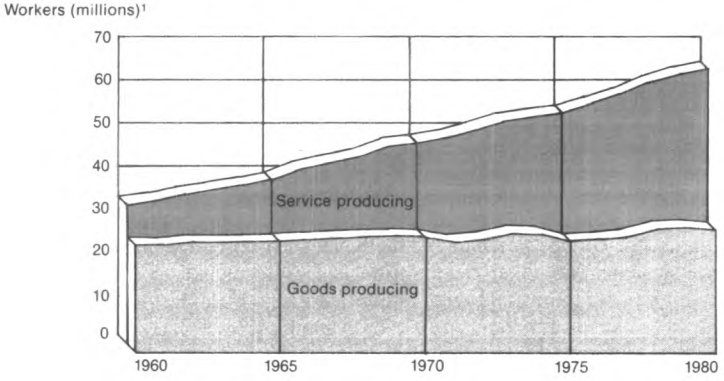
**Industries differ substantially in the kinds of workers they employ**




Source: Bureau of Labor Statistics

Chart 7

**Industries providing services employ more people than those providing goods**




[1]Wage and salary workers, except for agriculture, which includes self-employed and unpaid family workers
Source: Bureau of Labor Statistics



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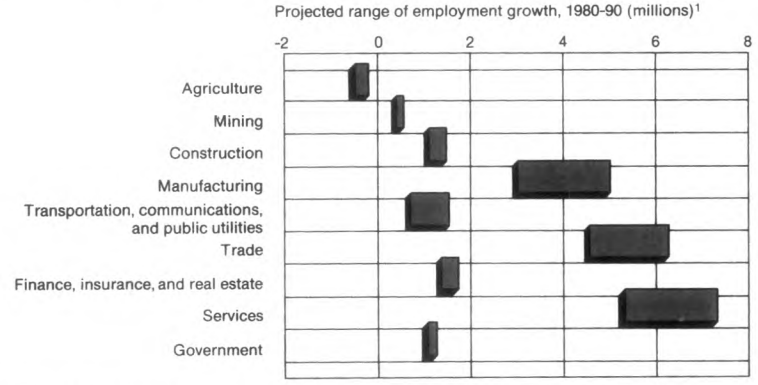
Chart 8

## Through the 1980's, changes in employment will vary widely among industries




[1]Wage and salary workers, except for agriculture, which includes self-employed and unpaid family workers
Source: Bureau of Labor Statistics

cent between 1970 and 1980. Growth varied greatly by industry, however. Between 1980 and 1990, employment in goods-producing industries is expected to increase from 29 million to between 32.5 and 35.5 million workers, or by 13 to 22 percent. Significant variation in growth rates is expected to continue among the four sectors that make up this group (chart 8).

*Agriculture*. Employment in agriculture declined 7 percent between 1970 and 1980, while farm output increased through the use of more and better machinery, fertilizers, feeds, pesticides, and hybrid plants.

Domestic demand for food will increase only slightly through the 1980's. The worldwide demand for food will rise because of population growth, and exports of food will increase through the next decade. Farm productivity, however, will continue to improve—although more slowly than in the past—and employment is expected to decline even as production rises. Between 1980 and 1990, employment is projected to drop from 3.1 million to between 2.6 and 2.9 million workers, or by 7 to 16 percent.

*Mining*. Having declined through most of the 1960's, employment in the mining sector increased substantially during the 1970's. Employment rose about 65 percent between 1970 and 1980, mostly because of the country's renewed emphasis on developing energy sources.

As the development of fuel resources, especially coal, continues through the next decade, employment in the mining sector is expected to grow from 1 million to between 1.2 and 1.3 million workers, or by 20 to 30 percent. In some nonenergy industries such as iron ore mining, employment will grow more slowly than in the sector as a whole. Improvements in mining techniques in these industries will permit increased output with only a slight increase in employment.

*Contract construction*. Despite several economic slumps, employment rose 25 percent between 1970 and 1980, because of strong demand for houses, apartments, office buildings, and highways.

During the 1980's, the demand for new housing is expected to remain high as the number of households continues to increase. Business expansion and maintenance of existing buildings also will require more construction. Between 1980 and 1990, employment in the construction sector is expected to increase from 4.5 million to between 5.6 and 6 million workers, or 24 to 34 percent.

*Manufacturing*. Although a growing population and rising incomes increased demand for almost all types of goods, improved production methods and stiff foreign competition limited employment growth in many manufacturing industries during the 1970's. In fact, the growth in employment over the decade, 5 percent, was less than in any other sector except agriculture.

Manufacturing employment is expected to rise to between 23.3 and 25.3 million workers by 1990, a 15- to 24-percent increase from the 1980 level of 20.4 million.

Manufacturing is divided into two broad categories, durable goods manufacturing and nondurable goods manufacturing. Employment in durable goods manufacturing is expected to increase 19 to 30 percent as rising population and incomes increase demand for consumer durables, such as automobiles and appliances, and rising business investment increases demand for capital goods, such as machinery. Employment in nondurable goods manufacturing will increase more slowly, by 8 to 15 percent, reflecting the tendency of consumers to spend less of their budget on staples such as food and clothing as their incomes rise.

Growth rates will vary among individual industries within each of these categories. In nondurable goods industries, for example, employment in bakeries is expected to decline, while a moderate rise in employment is projected for the paper industry. Among durable goods, computer equipment manufacturing is expected to undergo a rapid employment increase, while sawmills will employ about the same number of workers in 1990 as in 1980.

## Occupational Profile

Customarily, occupations are divided into white-collar occupations—professional and technical, managerial, clerical, and sales jobs; blue-collar occupations—craft, operative, and laborer jobs; service occupations; and farm occupations.

Growth rates among these groups have differed markedly since 1960. White-collar workers now represent about half of the total labor force up from 43 percent in 1960 (chart 9). The number of service workers also has risen rapidly, while the blue-collar work force has grown only slowly and farm workers have declined. The following section describes expected changes among the broad occupational groups between 1980 and 1990 (chart 10).

*Professional and technical workers*. This category includes many highly trained workers, such as scientists and engineers, medical practitioners, teachers, entertainers, pilots, and accountants. Between 1980 and 1990, employment is expected to grow from 16.4 million to between 19.7 and 20.7 million workers, or by 20 to 26 percent.

Greater efforts in energy development and industrial production will contribute to a growing demand for scientists, engineers, and technicians. The medical professions can be expected to grow as the health services industry expands. The demand for systems analysts and programmers to further develop and utilize computer resources is projected to grow rapidly.

Some occupations in this group will offer less favorable job prospects. For example, employment of secondary and college and university faculty is expected to decrease somewhat as a result of declining school enrollments. Other jobs, such as lawyer or architect, are expected to grow substantially but will be very competitive because they attract many applicants.

*Managers and administrators*. This group includes workers such as bank officers and managers, buyers, credit managers, and self-employed business operators. between 1980 and 1990, this group is expected to grow from 9.4 million to between 10.6 and 11.3 million, or by 13 to 21 percent.

Changes in business size and organizational structure have resulted in differing trends for self-employed and salaried managers. The number of self-employed business managers will continue to decline as large corporations and chain operations increasingly dominate many areas of business. Some small businesses, such as quick-service groceries and fast-food restaurants, still will provide opportunities for self-employment, however. The demand for salaried managers will continue to



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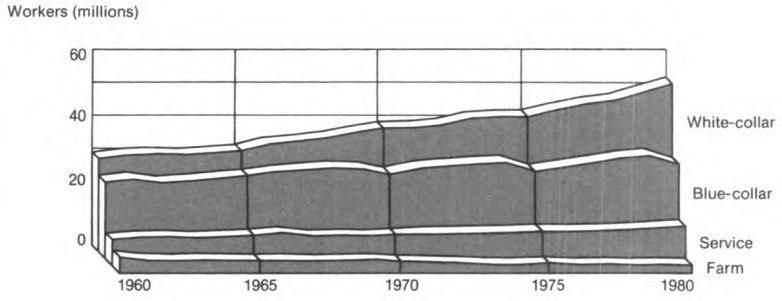
Chart 9

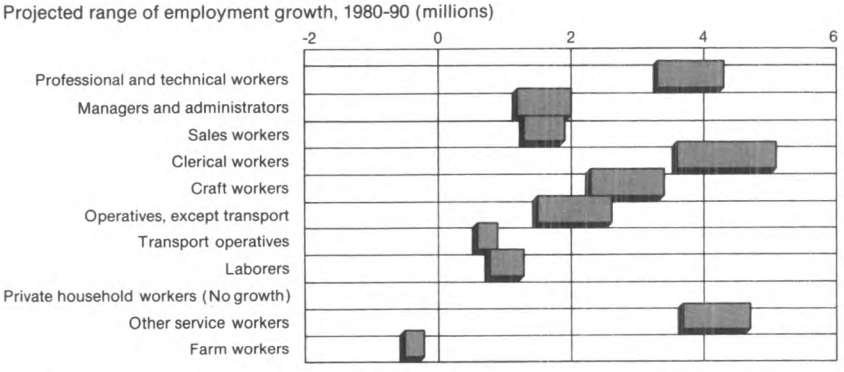
## White-collar workers have been the largest occupational group for more than two decades




Source: Bureau of Labor Statistics

Chart 10

## Through the 1980's, changes in employment will vary widely among occupational groups




Source: Bureau of Labor Statistics

grow as firms increasingly depend on trained management specialists, particularly in highly technical areas of operation.

*Clerical workers.* This group constitutes the largest occupational group and includes bank tellers, bookkeepers and accounting clerks, cashiers, secretaries, and typists. Between 1980 and 1990, employment in these occupations is expected to grow from 18.9 million to between 22.4 and 23.9 million workers, or by 19 to 27 percent.

Although new developments in computers, office machines, and dictating equipment will enable clerical workers to do more work in less time and will change the skills needed in some jobs, continued growth in employment is expected in most clerical occupations. Exceptions are keypunch operators, stenographers, and airline reservation and ticket agents—occupations that are expected to decline as improved technology reduces the need for workers. Conversely, the more extensive use of computers will greatly increase the employment of computer and peripheral equipment operators.

*Sales workers.* These workers are employed primarily by retail stores, manufacturing and wholesale firms, insurance companies, and real estate agencies. Employment in this group is expected to grow from 6.8 million to between 8.1 and 8.8 million workers, or by 19 to 28 percent.

Much of this growth will be due to expansion in the retail trade industry which employs nearly one-half of these workers. The demand for both full- and part-time sales workers in retail trade is expected to increase as the growing population along with its geographic movement requires more shopping centers and stores. Despite the use of laborsaving merchandising techniques such as computerized checkout counters, more stores and longer operating hours will cause employment to increase.

*Craft workers.* This group includes a wide variety of highly skilled workers, such as carpenters, tool-and-die makers, instrument makers, all-round machinists, electricians, and automobile mechanics. Between 1980 and 1990, employment in this group is expected to increase from 12.4 million to between 14.6 to 15.8 million, or by 18 to 27 percent.

Employment in many craft occupations is tied to trends in a particular industry. Employment in nearly all construction trades, for example, is expected to grow because of high demand for residential construction and business investment in new plants.

In contrast, the long-run employment decline in the railroad industry will lessen the demand for some craft occupations concentrated in that industry, such as railroad and car shop repairers. Because of advances in printing technology, very little growth is anticipated in the printing crafts.

*Operatives except transport.* This group includes production workers such as assemblers, production painters, and welders. Between 1980 and 1990, employment is expected to rise from 10.7 million to between 12.2 and 13.2 million workers, or by 14 to 23 percent.

Employment of operatives is tied closely to the production of goods, because the majority of these workers are employed in manufacturing industries. The projected slow growth of some manufacturing industries, along with improved production processes, will hold down the demand for many of these workers. Employment of textile operatives, for example, is expected to decline as more machinery is used in the textile industry.

*Transport operatives.* This group includes workers who drive buses, trucks, taxis, and forklifts, as well as parking attendants and sailors. Employment in most of these occupations will increase because of greater use of most types of transportation equipment. Some occupations, such as bus driver and sailor, will grow only slowly. Between 1980 and 1990, employment of transport operatives is expected to rise from 3.5 million to between 4.2 and 4.4 million workers, or by 18 to 26 percent.

*Laborers.* This group includes such workers as garbage collectors, construction laborers, and freight and stock handlers. Employment in this group is expected to grow slowly as machinery increasingly replaces manual labor. Power-driven equipment, such as forklift trucks, cranes, and hoists will handle more material in factories, loading docks, and warehouses. Other machines will do excavating, ditch digging, and similar work. Between 1980 and 1990, employment of laborers is expected to increase from 5.9 million to between 6.7 and 7.1 million workers or by 14 to 22 percent.

*Private household service workers.* These



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workers include housekeepers, child care workers, and maids and servants. In contrast to the rapid employment growth expected for other service occupations, the number of private household workers is projected to remain about the same as in 1980 when employment was 988,000. Although demand for maids and other private household workers should rise as more women work outside the home and personal incomes rise, fewer people are expected to seek these jobs because of the low wages, lack of advancement opportunities, and low social status associated with the work.

*Service workers.* This group includes a wide range of worker—firefighters, janitors, cosmetologists, and bartenders are a few examples. These workers, most of whom are employed in service-producing industries, make up the fastest growing occupational group. Factors expected to increase the need for these workers are the rising demand for health services as the population becomes older and—as incomes rise—more frequent use of restaurants, beauty salons, and leisure services. Between 1980 and 1990, employment of service workers is expected to increase by about 24 to 32 percent, from 14.6 million between 18.1 and 19.2 million workers.

*Farm workers.* This group includes farmers and farm managers as well as farm laborers. Employment of these workers has declined for decades as farm productivity has increased as a result of fewer but larger farms, the use of more efficient machinery, and the development of new feeds, fertilizers, and pesticides. Between 1980 and 1990 the number of farmworkers is expected to decline from 2.7 million to between 2.4 and 2.2 million workers, or by between 10 and 18 percent.

## Job Openings

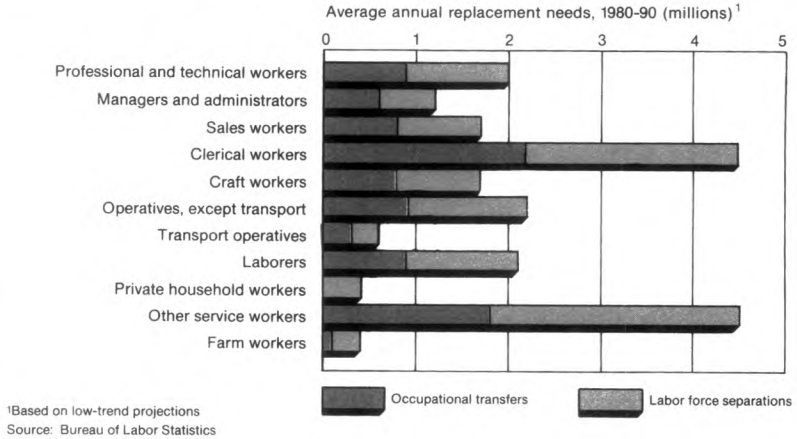
Projected employment growth is one indicator of future job prospects because it identifies the occupations in which demand for workers is increasing. Another is the total number of job openings that are expected to be generated from replacement needs as well as employment growth. Replacement needs result from the constant changes occurring in the work force as workers transfer to other jobs or stop working. Some workers transfer to other occupations either as a step up the career ladder or to change careers. Some workers temporarily stop working, perhaps to return to school or care for a family. And some workers leave the labor force permanently. These movements result in job openings for people outside the occupation. When these replacement needs are considered it becomes apparent that even occupations in which employment is expected to decline or to increase slowly can offer many job opportunities.

The number of replacement openings varies among occupations (chart 11). These variations reflect differences in the average age of workers in the occupation, the earnings and status associated with the job, and the level of required training. Construction laborers, for example, can quit and later easily find a similar or better job. On the other hand, physicians have few occupations of equal status and pay to which they could transfer. They also have invested a great deal of time and money in preparing for their careers. As a result the replacement rate is much higher for laborers than for physicians.

In the past, the Bureau's estimates of replacement needs included only job openings due to deaths and retirements. These estimates understated replacement needs because they excluded openings that are created as workers leave the labor force temporarily to return to school and for other personal reasons. They also excluded the number of openings that are generated as workers change occupations. After several years of research, the Bureau has developed openings estimates that take account of these factors. These new estimates should provide a more accurate picture of job opportunities resulting from replacement needs. Detailed information about the new estimates of replacement openings will be presented in the forthcoming bulletin, *Occupational Projections and Training Data, 1982 Edition.*

Chart 11

**Replacement needs result from occupational transfers and labor force separations**




[1]Based on low-trend projections
Source: Bureau of Labor Statistics



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# Assumptions and Methods Used in Preparing Employment Projections

Although the discussions of future employment contained in the *Handbook* are written in qualitative terms, they are based on quantitative estimates developed using the most recent data available on population, industry and occupational employment, productivity, consumer expenditures, and other factors expected to affect employment. The Bureau's staff specializing in developing economic and employment projections provided much of these data, but many other agencies of the Federal Government were important contributors as well, including the Bureau of Apprenticeship and Training of the Department of Labor; the Bureau of the Census of the Department of Commerce; the National Center for Education Statistics and the Rehabilitation Services Administration of the Department of Education; the Office of Personnel Management; the Interstate Commerce Commission; the Civil Aeronautics Board; the Federal Communications Commission; the Department of Transportation; and the National Science Foundation.

In addition, experts in industry, unions, professional societies, and trade associations furnished data and supplied information through interviews. Many of these individuals also reviewed preliminary drafts of the statements. The information presented in each statement thus reflects the knowledge and judgment not only of the Bureau of Labor Statistics staff, but also of leaders in the field discussed. The Bureau, of course, takes full responsibility for the published material.

Information compiled from these sources was analyzed in conjunction with alternative projections of the economy to 1990 constructed as part of the Bureau's projections program. Like other models used in projecting economic and employment development, the Bureau's system encompasses the major facets of the economy and represents a comprehensive view of its projected structure. It is comprised of a series of closely related projections encompassing labor force; gross national product (GNP); industrial output and productivity; average weekly hours of work; and employment for detailed industry groups and occupations. A detailed description of the model system appears in *The BLS Economic Growth Model System Used for Projections to 1990,* Bulletin 2112. For more detail on the projections used in developing this report, see the August 1981 issue of the *Monthly Labor Review.*

**Assumptions.** The Bureau has prepared three different scenarios of economic growth through the 1980's. Each alternative is based on the following general assumptions.

—Energy prices will not rise dramatically and alter the growth of GNP.

—The institutional framework of the U.S. economy will not change radically.

—Current social, technological, and scientific trends will continue.

—No major event such as widespread or long-lasting energy shortages or war will significantly alter the industrial structure of the economy or alter the rate of economic growth.

—Federal grants-in-aid to State and local governments will decline.

—Federal expenditures will decline as a proportion of GNP.

The differences among the scenarios reflect different sets of specific assumptions about fiscal and demographic factors, as well as productivity, employment, and price levels through the decade. The low-trend projection is characterized by assumptions of continuing high inflation, low productivity growth, and moderate expansion in real production. The high-trend I version assumes marked improvement in both inflation and productivity, greater labor force growth, and higher real production. Finally, the high-trend II version alternative assumes labor force growth consistent with the low trend, but greater productivity gains and less inflation than in the high-trend I version. Detailed information about the assumptions used in these projections is presented in *BLS Projections to 1990,* Bulletin 2121.

**Methods.** Beginning with population projections by age and sex developed by the Bureau of the Census, a projection of the total labor force is derived using expected labor force participation rates for each population group. In developing participation rates, the Bureau takes into account a variety of factors that affect decisions to enter the labor force, such as school attendance, retirement practices, and family responsibilities.

The labor force projection is then translated into the level of GNP that would be produced by the labor force at the assumed employment and unemployment levels. Real GNP then is calculated by subtracting unemployment from the labor force and multiplying the result by a projection of output per worker. The estimates of future output per worker are based on an analysis of trends in productivity (output per workhour) among industries and changes in average weekly hours of work.

Next, the projection of GNP is divided among its major components: Consumer expenditures, investment, government expenditures—Federal, State, and local—and net exports. These estimates of GNP by major component are derived using an economic model and by making assumptions about fiscal policy, taxes, and other major economic variables. Each of these major GNP components is in turn broken down by producing industry. Consumer expenditures, for example, are divided among industries producing goods and services such as housing, food, automobiles, medical care and education.

Once estimates are developed for these products and services, they are translated into detailed projections of industry output, not only for the industries producing the final product—such as an automobile—but also for the industries that provide electric power, transportation, component parts, and other inputs required in the production process. Input-output tables developed by the Department of Commerce and modified by the BLS are used to estimate output.

By using estimates of future output per workhour based on studies of productivity and technological trends for each industry, industry employment projections are derived from the output estimates. In addition, many detailed industries are studied using regression analysis. In these studies, equations are developed that relate employment by industry to combinations of economic variables, such as population and income, that are considered determinants of long-run changes in employment. The industry employment projections developed through these studies are evaluated with data generated by the basic model to develop the final industry employment projections. They also are used to develop projections for industries that are not included in the basic model.

**Occupational employment projections.** Projections of industry employment are translated into occupational employment projections using an industry-occupation matrix. The Bureau



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converted the National Industry-Occupational Employment Matrix from a Census base to an Occupational Employment Statistics (OES) survey base in 1981; this edition of the *Handbook* is the first to incorporate the OES data. The new matrix is divided into 378 industries and about 1,600 occupations, offering far greater detail than has been available on the current and projected employment structure of the economy.

Staffing patterns that reflect data from the OES surveys are projected to the target year (currently 1990) and, when applied to projections of total employment by industry and summed across all industries, yield employment projections for all occupations in the matrix. Thus, the projected employment of an occupation is determined by changes in the proportion of workers in the occupation in each industry, and the growth rate of industries in which an occupation is concentrated. For example, employment in an occupation would be projected to grow: (1) if its proportion of the work force increases but industry employment remains constant, or (2) if its proportion of the work force remains constant but industry employment increases.

In some cases, employment is projected on the basis of its relationship to certain independent variables rather than on its representation in each industry. This approach is particularly useful when projecting employment for an occupation that is affected by its own complex set of factors. For example, employment of elementary school teachers is projected based on trends in pupil-teacher ratios applied to projected school attendance, and the projection of automobile mechanics is based on the expected stock of motor vehicles. Projections that are developed independently are compared with those in the matrix and revised, if necessary, to assure consistency.

**Replacement needs.** In addition to a projection of employment, an estimate is made of the total number of job openings expected to occur in each occupation. Growth in the size of an occupation is only one source of job openings. Employment opportunities also occur when workers transfer to another occupation, leave the labor force temporarily, retire, or die.

In previous editions of the *Handbook,* estimates of replacement needs reflected only openings due to permanent labor force separations. They did not take into account job openings created by the movement of workers between occupations or by workers who temporarily stop working for school, family, or other reasons. These estimates seriously understated replacement needs for many occupations, thereby hindering an accurate assessment of job market conditions in specific occupations.

Using longitudinal data from the Current Population Survey (CPS), estimates of job openings from all sources have been derived that should provide a more comprehensive view of the demand for workers through the 1980's.

The development of job openings information based on CPS data is described in *Measuring Labor Force Movements: A New Approach,* BLS Report 581. Detailed job openings information for some of the occupations covered in the *Handbook* will be presented in the forthcoming BLS bulletin, *Occupational Projections and Training Data, 1982 Edition.*



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# Administrative and Managerial Occupations

Managers and administrators achieve organizational objectives by planning and directing the activities of others. In a very small enterprise, the owner may also be the manager. However, as a business or other organization grows and becomes more complex, more people are needed to oversee the operations of the work force. Large corporations or government agencies may employ hundreds of managers, organized into a hierarchy of administrative positions.

Top level managers—executives—are primarily concerned with policymaking, planning, and overall coordination. They direct the activities of the organization through departmental or mid-level managers. Top level managers include school superintendents, police and fire chiefs, bank presidents, governors, mayors, hospital administrators, chief executive officers of corporations, department store managers, and government agency directors.

Below the top management in a large organization are the middle managers, who direct various departments. Middle managers may handle a particular area, such as personnel, accounting, sales, finance, or marketing. Or they may supervise the production process at a factory or industrial plant. Middle managers are the people who keep things running smoothly. They organize activities at the operating level and provide direct supervision.

Middle managers work with the assistance of support personnel who plan, organize, analyze, and monitor activities. Support personnel include accountants, loan officers, employment interviewers, purchasing agents and buyers, credit managers, membership directors, promotion agents, and inspectors of all kinds. Jobs such as these require technical expertise or a thorough understanding of a particular procedure or operation.

Managers and administrators are employed in virtually every type of industrial plant, commercial enterprise, and government agency. Large numbers are employed in finance, insurance, real estate, construction, public administration, health, education, transportation, and public utilities.

The accompanying table presents 1980 employment estimates for selected administrative and managerial occupations.

Because of the wide range of establishments employing managers, job duties vary greatly. For example, the manager of a fast food restaurant performs tasks that differ substantially from those of a school administrator, community organization director, or construction manager.

As the nature of the work varies, so does the level of education required. Some managers and administrators, including school principals and hospital administrators, need at least a master's degree. Positions such as these require the specialized knowledge and skills obtained through years of formal education. Other positions, including production supervisor, retail buyer, construction manager, and maintenance superintendent, may not require a college degree. People in these jobs often have worked their way up in the organization. Their main qualification is a thorough knowledge of the operating procedures of the workplace. Most managerial and administrative positions require a college education, however. In some occupations—such as accounting—continuing education is important for career advancement.

On-the-job training enables workers with management potential to "learn the ropes." Particularly in wholesale and retail trade, many managers begin as management trainees, working under the direction of more experienced managers. Management trainees may be hired from outside the organization or promoted from other positions within it. On-the-job training programs provide trainees with the specific knowledge and experience they need to perform successfully.

Despite the differences in formal education and training, successful managers are likely to have certain characteristics in common. Because they work with people, managers need to be able to get along with and motivate and influence others. They should be able to inspire confidence and respect in those who work for them.

When they make plans and set goals for their enterprise, managers work with ideas. They need organzational skills, good judgment, and decisionmaking ability. Successful managers have mastered the art of getting all the facts, coming to a decision, and communicating it effectively. They need a strong sense of initiative to be able to work without close supervision.

For some administrative positions analytical, evaluative, and promotional skills are essential. Accountants, financial analysts, and others provide the technical expertise upon which management decisions are based. Good judgment and the ability to relate to others are important for people in these occupations.

Earnings for managers and administrators vary widely. They depend on the industry and on the size and nature of the particular establishment in which the manager is employed. Earnings also vary with the level of managerial or administrative responsibility. For example, management trainees may start working at salaries that are not much higher than those of the people they supervise. Earnings increase as managers gain experience, prove their ability to handle the job, and take on additional responsibility.

On the whole, employment of managers and administrators is projected to grow about as fast as the average for all occupations through the 1980's. The growing size and complexity of both private and government enterprise is expected to require increasingly sophisticated management techniques. Therefore, the demand for trained management specialists will increase.

Employment opportunities will be better in some industries than in others, however. Little employment growth is foreseen in educational institutions during the 1980's, and therefore most job openings for school ad-

**Table 1. Employment in selected administrative and managerial occupations, 1980**

| Occupation | Employment |
|---|---|
| Accountants, auditors, and related occupations | 887,000 |
| Accountant and auditor | 833,000 |
| Tax examiner, collector, and revenue agent | 54,000 |
| Restaurant, cafe and bar manager | 557,000 |
| Sales manager, retail trade | 273,000 |
| Personnel and labor relations specialist | 178,000 |
| Purchasing agent and buyer | 172,000 |
| Inspector (except construction), public administration | 112,000 |
| Cost estimator | 86,000 |
| Underwriter | 76,000 |
| Employment interviewer | 58,000 |
| Construction inspector, public administration | 48,000 |
| Assessor | 32,000 |
| Tax preparer | 31,000 |
| Postmaster and mail superintendent | 28,000 |
| Credit analyst | 24,000 |
| Special agent, insurance | 24,000 |
| Claim examiner, property/casualty insurance | 22,000 |
| Claim taker, unemployment | 15,000 |
| Media buyer | 15,000 |
| Welfare investigator | 12,000 |
| Chief credit analyst | 8,000 |
| Safety inspector | 6,000 |

SOURCE: Bureau of Labor Statistics.



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ministrators will result from replacement needs. By contrast, projected expansion in the health industry will generate many new managerial and administrative support positions in hospitals, clinics, nursing homes, insurance companies, pharmaceutical and medical supply firms, and other health-related organizations. Employment growth should also be strong in wholesale and retail trade and in manufacturing.

Both the number and proportion of self-employed managers and administrators are expected to decline during the 1980's, as large enterprises and chain operations increasingly dominate business activity.

# Accountants and Auditors

(D.O.T. 160 and 090.227-010)

## Nature of the Work

Managers must have up-to-date financial information to make important decisions. Accountants and auditors prepare and analyze financial reports that furnish this kind of information.

Three major fields are public, management, and government accounting. Public accountants have their own businesses or work for accounting firms. Management accountants, also called industrial or private accountants, handle the financial records of their company. Government accountants and auditors examine the records of government agencies and audit private businesses and individuals whose dealings are subject to government regulations.

Accountants often concentrate on one phase of accounting. For example, many public accountants specialize in auditing (examining a client's financial records and reports and attesting that they are in comformity with standards of preparation and reporting). Others specialize in tax matters, such as preparing income tax forms and advising clients of the tax advantages and disadvantages of certain business decisions. Still others specialize in management consulting and offer advice on a variety of matters. They might develop or revise an accounting system to serve the needs of clients more effectively or give advice about various types of computers or electronic data processing systems.

Management accountants provide the financial information executives need to make sound business decisions. They may work in areas such as taxation, budgeting, costs, or investments. Internal auditing, a specialization within management accounting, is rapidly growing in importance. Internal auditors examine and evaluate their firm's financial systems and management control procedures to ensure efficient operation.

Many persons with accounting backgrounds work for the Federal Government as Internal Revenue Service agents or are involved in financial management, financial institution examining, and budget administration.

Accountants staff the faculties of business and professional schools as accounting teachers, researchers, or administrators. Some accountants teach part time, work as consultants, or serve on committees of professional organizations. For additional information, see the *Handbook* statement on college and university faculty.

## Working Conditions

Most accountants and auditors work in offices and have structured work schedules. Accounting teachers, on the other hand, with more flexible schedules, divide their time among teaching, research, and administrative responsibilities. Self-employed accountants, who may set up offices at home, work as many hours as the business requires.

Tax accountants work long hours under heavy pressure during the tax season. Accountants employed by large firms may travel extensively to audit or work for clients or branches of the firm.

## Employment

About 900,000 people worked as accountants and auditors in 1980, including more than 200,000 Certified Public Accountants (CPA), 20,000 licensed public accountants, and about 10,000 Certified Internal Auditors (CIA).

Most accountants do management accounting. Many others are engaged in public accounting as proprietors, partners, or employees of independent accounting firms. Other accountants work for Federal, State, and local government agencies, and some teach in colleges and universities. Opportunities are plentiful for part-time work, particularly in smaller firms.

Accountants and auditors are found in all business, industrial, and government organizations. Most, however, work in large urban areas where many public accounting firms and central offices of large businesses are concentrated.

## Training, Other Qualifications, and Advancement

Training is available at colleges and universities, accounting and business schools, and correspondence schools. Although many graduates of business and correspondence schools are successful in landing junior accounting positions, most public accounting and business firms require applicants for accountant and internal auditor positions to have at least a bachelor's degree in accounting or a closely related field. Many employ-

Accountants need mathematical and analytical skills.

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ers prefer those with the master's degree in accounting. A growing number of large employers prefer applicants who are familiar with computers and their applications in accounting and internal auditing. For beginning accounting and auditing positions, the Federal Government requires 4 years of college (including 24 semester hours in accounting or auditing) or an equivalent combination of education and experience. However, applicants face competition for the limited number of openings in the Federal Government. For teaching positions, most colleges and universities generally require a doctoral degree or the Certified Public Accountant Certificate.

Previous experience in accounting or auditing can help an applicant get a job. Many colleges offer students an opportunity to gain experience through summer or part-time internship programs conducted by public accounting or business firms. Such training is invaluable in gaining permanent employment in the field.

Professional recognition through certification or licensure also is extremely valuable. Anyone working as a "certified public accountant" must hold a certificate and a license issued by a State board of accountancy. All States use the four-part Uniform CPA Examination, prepared by the American Institute of Certified Public Accountants, to establish certification. The CPA examination is rigorous and candidates are not required to pass all four parts at once. However, most States require candidates to pass at least two parts for partial credit. Many States require all sections of the test to be passed within a certain period of time. Although the vast majority of States require CPA candidates to be college graduates, some States substitute a certain number of years of public accounting experience for the educational requirement. Most States require applicants to have some public accounting experience for a CPA certificate. For example, bachelor's degree holders most often need 2 years of experience while master's degree holders often need no more than 1 year. Based on recommendations made by the American Institute of Certified Public Accountants, a few States now require or are considering requiring CPA candidates to have training beyond a bachelor's degree and, in some cases, a master's degree. This trend is expected to continue in the coming years.

For a "public accountant" or "accounting practitioner" license or registration, some States require only a high school diploma while others require college training. Information on requirements may be obtained directly from individual State boards of accountancy or from the National Society of Public Accountants (NSPA).

The Accreditation Council for Accountancy awards accreditation in accountancy to persons who have passed a comprehensive examination. Accreditation is maintained by completing mandatory continuing education. The Institute of Internal Auditors, Inc., confers the Certified Internal Auditor (CIA) upon graduates from accredited colleges and universities who have completed 3 years' experience in internal auditing and who have passed a four-part examination. The National Association of Accountants (NAA) confers the Certificate in Management Accounting (CMA) upon candidates who pass a series of uniform examinations and meet specific educational and professional standards.

Persons planning a career in accounting should have an aptitude for mathematics, be able quickly to analyze, compare, and interpret facts and figures, and to make sound judgments based on this knowledge. They must question how and why things are done and be able to clearly communicate the results of their work, orally and in writing, to clients and management.

Accountants and auditors must be patient and able to concentrate for long periods of time. They must be good at working with systems and computers as well as with people. Accuracy and the ability to handle responsibility with limited supervision are important.

Perhaps most important, because millions of financial statement users rely on the services of accountants and auditors, the public expects accountants and auditors to have high standards of integrity.

A growing number of States require both CPA's and licensed public accountants to complete a certain number of hours of continuing education before licenses can be renewed. The professional associations representing accountants sponsor numerous courses, seminars, group study programs, and other forms of continuing education. Increasingly, accountants and auditors are studying computer programming so they can adapt accounting procedures to data processing. Although capable accountants and auditors should advance rapidly, those having inadequate academic preparation may be assigned routine jobs and find promotion difficult.

Junior public accountants usually start by assisting with auditing work for several clients. They may advance to intermediate positions with more responsibility in 1 or 2 years and to senior positions within another few years. Those who deal successfully with top industry executives often become supervisors, managers, or partners, or transfer to executive positions in private firms. Some open their own public accounting offices.

Beginning management accountants often start as ledger accountants, junior internal auditors, or as trainees for technical accounting positions. They may advance to chief plant accountant, chief cost accountant, budget director, or manager of internal auditing. Some become controllers, treasurers, financial vice-presidents, or corporation presidents. Many corporation executives have backgrounds in accounting and finance.

In the Federal Government, beginners are hired as trainees and usually are promoted in a year or so. In college and university teaching, those having minimum training and experience may receive the rank of instructor without tenure; advancement and permanent faculty status depend upon further education and teaching experience and are increasingly difficult to attain.

## Job Outlook

Employment is expected to grow faster than the average for all occupations through the 1980's due to increasing pressure on businesses and government agencies to improve budgeting and accounting procedures. Because the occupation is large, many job openings should result from the need to replace workers who leave the occupation, retire, or die.

Demand for skilled accountants and auditors will rise as managers rely increasingly on accounting information to make business decisions. For example, plant expansion, mergers, or foreign investments may depend upon the financial condition of the firm, tax implications of the proposed action, and other considerations. On a smaller scale, small businesses are expected to rely more and more on the expertise of public accountants in planning their operations. Legislation regarding pension reform, tax reform, financial disclosure, and other matters should create many jobs for accountants and auditors. In addition, increases in investment and lending also should spur demand for accountants and auditors.

College graduates will be in greater demand for accounting and auditing jobs than applicants who lack this training. CPA's should have a wider range of job opportunities than other accountants. Opportunities for accountants without a college degree will occur mainly in small businesses and accounting firms.

Many employers prefer graduates who have worked part time in a business or accounting firm while in school. In fact, experience has become so important that some employers in business and industry seek persons with 1 or 2 years' experience for beginning positions.

The increasing use of computers and electronic data processing systems in accounting and auditing should stimulate the demand for those trained in such procedures. Opportunities should be particularly good for internal auditors and tax accountants.

## Earnings

According to a 1980 College Placement Council Salary Survey, bachelor's degree candidates in accounting received offers averaging around $16,800 a year; master's degree candidates, $19,200.

The starting salary of beginning accountants in private industry was about $15,100 a year in 1980, according to a national survey. Earnings of experienced accountants ranged between $18,400 and $31,900, depending on

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their level of responsibility and the complexity of the accounting system. Chief accountants who direct the accounting program of a company or one of its establishments earned between $28,300 and $50,100, depending upon the scope of their authority and size of professional staff.

According to the same survey, beginning auditors averaged $14,900 a year in 1980, while experienced auditors' earnings ranged between $18,000 and $26,800.

In the Federal Government, the starting annual salary for junior accountants and auditors was about $12,300 in early 1981. Candidates who had a superior academic record could begin at $15,200. Applicants with a master's degree or 2 years' professional experience began at $18,600. Accountants and auditors in the Federal Government averaged about $27,700 a year in 1980.

According to a 1980 survey of State governments, average annual salaries of beginning accountants or auditors ranged from about $12,800 to $17,400; principal auditors (work at first level of full supervision), $18,800 to $25,600; accounting supervisors (work at first level of full supervision), $17,300 to $23,700; and chief fiscal officers (those who administer accounting and fiscal management programs of large State agencies), $24,000 to $32,400.

## Related Occupations

Accountants and auditors design and control financial records and analyze financial data. Others for whom training in accounting is invaluable include appraisers, budget officers, loan officers, financial analysts, bank officers, actuaries, underwriters, FBI special agents, securities sales workers, and purchasing agents.

## Sources of Additional Information

Information about careers in accounting and about aptitude tests administered in high schools, colleges, and public accounting firms may be obtained from:

American Institute of Certified Public Accountants, 1211 Avenue of the Americas, New York, N.Y. 10036.

Information on specialized fields of accounting and auditing is available from:

National Association of Accountants, 919 Third Ave., New York, N.Y. 10022.

National Society of Public Accountants and Accreditation Council for Accountancy, 1010 North Fairfax St., Alexandria, Va. 22314.

Institute of Internal Auditors, 249 Maitland Ave., Altamonte Springs, Fla. 32701.

For information on educational institutions offering a specialization in accounting, contact:

American Assembly of Collegiate Schools of Business, 11500 Olive Blvd., Suite 142, St. Louis, Mo. 63141.

# Bank Officers and Managers

(D.O.T. 186.117-026, -038, -050, -054, -070,-074, -078, .137-010, .167-014, -050, -054, -058, and .267-018)

## Nature of the Work

Practically every bank has a president who directs operations; one or more vice presidents who act as general managers or who are in charge of bank departments such as trust or credit; and a comptroller or cashier who, unlike cashiers in stores and other businesses, is an executive officer generally responsible for all bank property. Large banks also may have treasurers and other senior officers, as well as junior officers, to supervise the various sections within different departments. Banks employed over 400,000 officers and managers in 1980.

Bank officers make decisions within a framework of policy set by the board of directors and existing laws and regulations. They must have a broad knowledge of business activities to relate to the operations of their department. For example, loan officers evaluate the credit and collateral of individuals and businesses applying for a loan. Similarly, trust officers must understand each account before they invest funds to support families, send young people to college, or pay retirement pensions. Besides supervising financial services, officers advise individuals and businesses and participate in community projects.

Because banks offer many services, a wide choice of careers is available to workers who specialize.

Loan officers may handle installment, commercial, real estate, or agricultural loans. To evaluate loan applications properly, officers need to be familiar with economics, production, distribution, merchandising, and commercial law. Also, they need to know business operations and should be able to analyze an industry's financial statements.

Bank officers in trust management require knowledge of financial planning and investment for investment research and for estate and trust administration.

Operations officers plan, coordinate, and control the workflow, update systems, and strive for administrative efficiency. Careers in bank operations include electronic data processing manager and other positions involving internal and customer services.

A correspondent bank officer is responsible for relations with other banks; a branch manager, for all functions of a branch office; and an international officer, for advising customers with financial dealings abroad. A working knowledge of a foreign country's financial system, trade relations, and economic conditions is beneficial to those interested in international banking.

Other career fields for bank officers are auditing, economics, personnel administration, public relations, and operations research.

## Working Conditions

Since a great deal of bank business depends on customers' impressions, officers and managers are provided attractive, comfortable offices and are encouraged to wear conservative, somewhat formal, business clothes. Bank officers and managers typically work 40 hours a week; however, attending civic functions, keeping abreast of community developments, establishing and maintaining business contacts, and similar activities are aspects of their jobs that occasionally require overtime work.

Bank officers often specialize in one area of bank operations.

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## Training, Other Qualifications, and Advancement

Bank officer and management positions are filled by management trainees, and by promoting outstanding bank clerks or tellers. College graduation usually is required for management trainees. A business administration major in finance or a liberal arts curriculum, including accounting, economics, commercial law, political science, and statistics, serves as excellent preparation for officer trainee positions. A Master of Business Administration (MBA) in addition to a social science bachelor's degree, which some employers prefer, may provide an even stronger educational foundation. However, banks do hire people with diverse backgrounds such as chemical engineering, nuclear physics, and forestry to meet the needs of complex, high-technology industries with which they deal. Valuable experience may be gained through summer employment programs.

A management or officer trainee may spend a year or two learning the various banking areas before choosing a permanent position. This practice is common but not universal. A bank may hire an applicant with specific skills for a position that is clearly defined at the outset.

Persons interested in becoming bank officers should like to work independently and to analyze detailed information. The ability to communicate, both orally and in writing, is important. They also need tact and good judgment to counsel customers and supervise employees.

Advancement to an officer or management position may come slowly in small banks where the number of positions is limited. In large banks that have special training programs, promotions may occur more quickly. For a senior officer position, however, an employee usually needs many years of experience.

Although experience, ability, and leadership are emphasized for promotion, advancement may be accelerated by special study. Banks often provide opportunities for workers to broaden their knowledge and skills. Many banks encourage employees to take courses at local colleges and universities. In addition, banking associations sponsor a number of programs, sometimes in cooperation with colleges and universities. The American Bankers Association (ABA) offers the most extensive national program for bank officers. Each of its dozen schools, located all over the country, deals with a different phase of banking. Those enrolled prepare extensively at home, then attend annual sessions of 1 or 2 weeks for a period of 1 to 3 years in areas such as commercial lending, installment credit, and international banking. ABA also sponsors annual seminars and conferences and provides textbooks and other educational materials. Many banks pay all or part of the costs for those who successfully complete courses. The American Institute of Banking, an arm of the ABA, has long filled the same educational need among bank support personnel. (See the statements on bank clerks and bank tellers elsewhere in the *Handbook*.)

Because banking is an essential part of business, well-trained, experienced officers and managers may transfer to closely related positions in other areas of finance or to positions within other industries, such as manufacturing, that need individuals with banking experience.

## Job Outlook

Through the 1980's, employment of bank officers is expected to increase faster than the average for all occupations. Rising costs due to expanded banking services and the increasing dependence on computers will require more officers to provide sound management and effective quality control. Greater international trade and investment will stimulate international and domestic banking activities, thus increasing the need for bank officers and managers. Adding to this increase in demand due to growth will be the need to replace experienced officers who die, retire, or leave their jobs for other reasons.

Because of the increasing number of qualified applicants, competition for bank managerial positions is expected to stiffen. Once employed, managers and officers are likely to work year-round, even during periods of slow economic activity, because cyclical swings in the economy seem to have little immediate effect on banking activities.

## Earnings

Officer trainees at the bachelor's level generally earned between $1,100 and $1,300 a month in 1980. Those with master's degrees generally started at between $1,300 and $1,900 a month. A Master of Business Administration, however, appears to be worth more in salary terms: Graduates with an MBA were offered starting salaries of $1,400 to $2,400 a month in 1980.

Salaries of senior bank officers may be several times as much as starting salaries. The actual salary level depends upon the particular position and the size and location of the bank. For officers, as well as for other bank employees, earnings are likely to be lower in small towns than in big cities.

## Related Occupations

Bank officers and managers combine formal schooling with experience in one or more areas of banking, such as lending, to provide services for customers. Other occupations which require similar training and ability include business representatives, industrial relations directors, safety council directors, city managers, export managers, and purchasing agents.

## Sources of Additional Information

General information about banking occupations, training opportunities, and the banking industry itself is available from:

American Bankers Association, Bank Personnel Division, 1120 Connecticut Ave. NW., Washington, D.C. 20036.

National Association of Bank Women, Inc., National Office, 500 N. Michigan Ave., Chicago, Ill. 60611.

National Bankers Association, 499 S. Capitol St. SW., Suite 520 , Washington, D.C. 20003.

For information about career opportunities as a bank examiner, contact:

Federal Deposit Insurance Corporation, Director of Personnel, 550 17th St. NW., Washington, D.C. 20429.

Federal Savings and Loan Insurance Corporation, Office of the General Counsel, 1700 G St. NW., Washington, D.C. 20552.

Information on careers with the Federal Reserve System is available from:

Board of Governors, The Federal Reserve System, Personnel Department, Washington, D.C. 20551, or from the personnel department of the Federal Reserve bank serving each geographic area.

State bankers' associations can furnish specific information about job opportunities in their State. And writing directly to a particular bank to inquire about job openings can produce favorable results. For the names and addresses of banks in a specific location as well as the names of their principal officers, consult one of the following directories, which are published twice each year:

*The American Bank Directory* (Norcross, McFadden Business Publications).

*Bankers Directory-The Banker's Blue Book* (Chicago, Rand McNally International).

*Polk's World Bank Directory* (Nashville, R.L. Polk & Co.).

# Buyers

(D.O.T. 162.157-018 and -022)

## Nature of the Work

The Americans have been invited to a private showing of the latest fashions in Paris. Representing a major New York department store, they sit with a select group in an elegantly furnished room. They watch graceful models float down the runway displaying the latest creations by the world's most famous designers. After some consultation, they purchase thousands, perhaps millions of dollars worth of goods. All in a day's work.

The job of retail buyer often brings to mind the glamour of high fashion; indeed, many fashion buyers do lead exciting, fast-paced lives. Not every buyer, however, travels abroad or deals in fashion. All merchandise sold in a retail store—garden furniture, automobile tires, toys, aluminum pots, and canned soups—appears there on the decision of a buyer. Buyers seek goods that satisfy their stores' customers and sell at a profit. The kind and variety of goods they purchase depend on the store. A buyer for a small clothing store, for example, may purchase its complete stock of merchandise, from sportswear to formal wear. Buyers in larger retail businesses often handle one or a few related lines of goods, such as men's wear, ladies' sportswear, or children's clothes. Some,

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known as *foreign buyers*, purchase merchandise outside the United States.

In order to purchase the best merchandise for their stores, buyers must be familiar with the manufacturers and distributors who have the merchandise they need. They also must keep informed about changes in existing products and the development of new ones. To do this, buyers attend fashion and trade shows and visit manufacturers' showrooms. They usually order goods during these buying trips, and also when wholesale and manufacturers' sales workers call on them to display their merchandise.

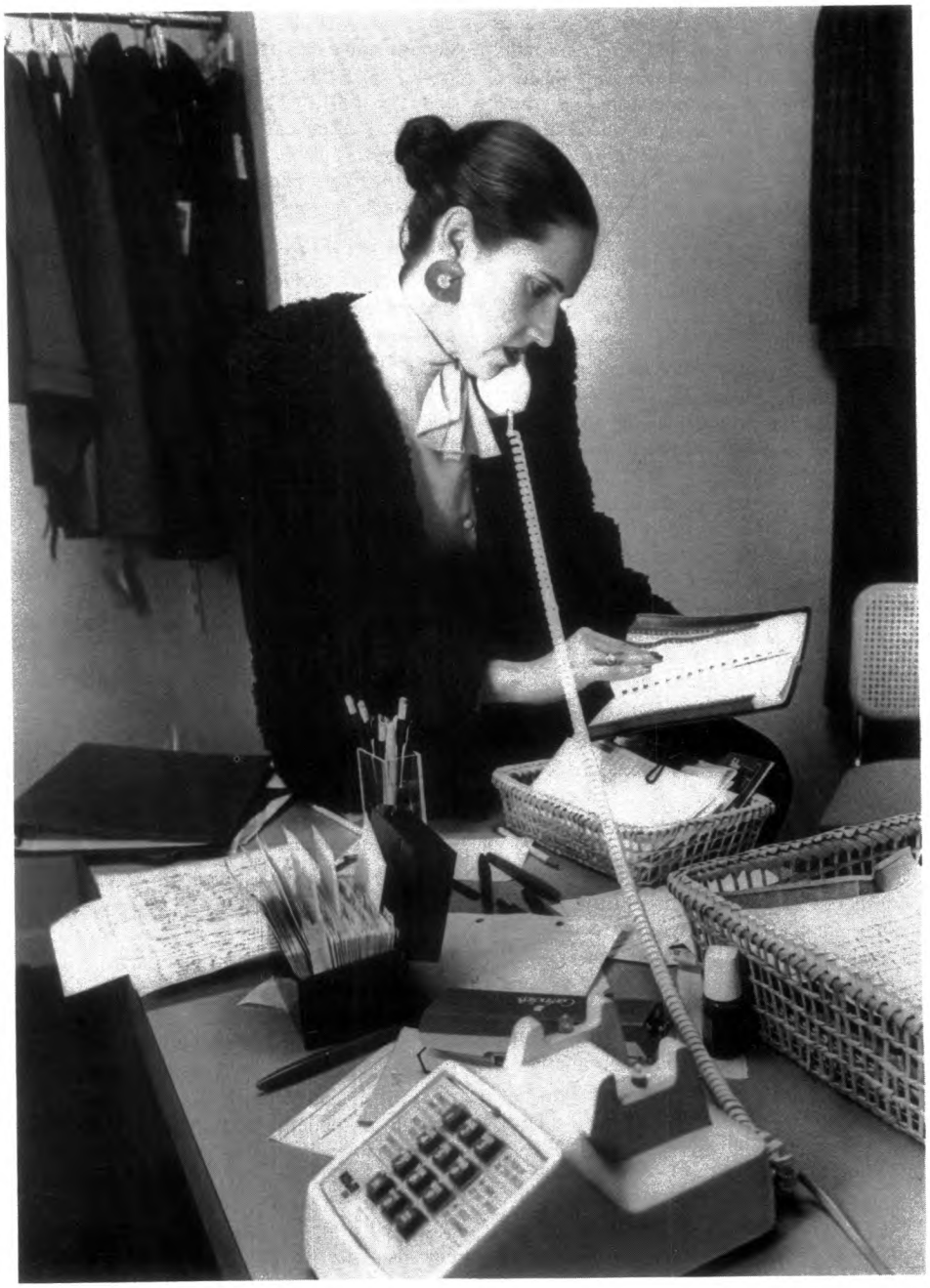
Buyers must be able to assess the resale value of goods after a brief inspection and make a purchase decision quickly. They try to select merchandise that will sell quickly at well above the original cost. Since most buyers work within a fixed budget, they must plan their purchases to keep needed items always in stock but also allow for special purchases when a "good buy" presents itself.

Because buyers purchase merchandise for resale (unlike purchasing agents who buy goods for direct use by the firm—see the statement on purchasing agents elsewhere in the *Handbook*), they must know what motivates customers to buy. Before ordering merchandise, buyers study market research reports and past sales records to determine what products are currently in demand. They also work closely with assistant buyers and sales clerks whose daily contact with customers furnishes information about consumer likes and dislikes. In addition, buyers read fashion and trade magazines to keep abreast of style and manufacturing trends, follow competitors' ads in newspapers and other media, and watch general economic conditions to anticipate consumer buying patterns.

Buyers are usually supervised by *merchandise managers* (D.O.T. 185.167-034) who plan and coordinate buying and selling activities for large and medium-sized stores. These individuals are not involved in actual buying activities. They determine the amount of merchandise to be stocked, what the markups and markdowns should be, and plan sales promotions.

Buyers and merchandise managers usually have busy schedules and deal with many people in a day. They work with manufacturers' representatives, store executives, assistant buyers, sales workers, and customers. Buyers assist with sales promotions and create enthusiasm among sales personnel, provide information, such as dress sizes and product descriptions to the advertising department for sales promotions, and meet with floor sales workers about new merchandise. Some buyers direct assistants who handle routine aspects of purchasing such as verifying shipments; others supervise department managers.

New technology has altered the buyer's role in retail chainstores. In the past, firms employed a buyer for each department, for example, the hardware department, for a group of stores in a local area. Now cash registers connected to a computer, known as point-of-sale terminals, allow retail chains to maintain centralized, up-to-the-minute inventory records. With these records, a single buyer can purchase hardware for the entire chain.



Buyers usually have very busy schedules.

## Working Conditions

Retailing is a highly competitive business, and buyers operate under pressure. Anticipating customers' preferences and ensuring that goods are in stock when they are needed is far from easy, and mistakes can be costly. The buyer's job calls for resourcefulness and good judgment, as well as the self-confidence to make decisions and take risks. However, many successful buyers feel that the stimulation and excitement of the job more than make up for any emotional strain.

Buyers frequently work more than a 40-hour week because of special sales, conferences, and travel. The amount of traveling varies with the type of merchandise and the location of suppliers, but most spend 4 or 5 days a month on the road.

## Employment

In 1980, approximately 150,000 buyers worked for retail firms. Although buyers work in all parts of the country, most are in major metropolitan areas where retail stores are concentrated.

## Training, Other Qualifications, and Advancement

Because familiarity with merchandise and with the retailing business is important for buyers, prior retailing experience is helpful in

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getting a job. High school distributive education programs have launched careers in retailing that led eventually to a buyer's position. (More information about distributive education appears in the statement on retail trade sales workers elsewhere in the *Handbook*.)

An increasing number of employers prefer applicants who have a college degree. Many colleges and universities offer associate degree or bachelor's degree programs in marketing and purchasing. Postsecondary training also is offered in vocational schools or technical institutes that prepare students for careers in fashion merchandising.

While courses in merchandising or marketing may help in getting started in retailing, they are not essential. Most employers accept college graduates in any field of study and train them on the job. Many stores have 6- to 8-month programs for buyer trainees. They combine classroom instruction in merchandising and purchasing with short rotations to various jobs in the store. This training introduces the new worker to store operations and policies, and to the fundamentals of merchandising and management.

Most trainees begin as assistant buyers, selling merchandise, supervising sales workers, checking invoices on material received, and keeping account of stock on hand. They gradually assume buying responsibilities. They usually work as assistant buyers for at least a year before becoming buyers. Experienced buyers may advance to merchandise manager and some advance to executive jobs such as general merchandise manager for a store or chain.

Buyers should be good at planning and decisionmaking and have an interest in merchandising. They need leadership ability and communications skills to supervise sales workers and assistant buyers and to deal effectively with manufacturers' representatives and store executives. Because of the fast pace and pressure of their work, buyers need physical stamina and emotional stability.

## Job Outlook

Employment of buyers is expected to grow about as fast as the average for all occupations through the 1980's as the retail trade industry, where buyers work, expands in response to a growing population and higher personal incomes. Besides jobs that will be created by increased demand for buyers, many job openings will arise each year from the need to replace workers who transfer to other occupations, retire, or die.

Competition for buying jobs is expected to be keen, for merchandising attracts many college graduates. Prospects are likely to be best for qualified applicants who enjoy the competitive, fast-paced nature of retailing.

## Earnings

Income of buyers depends upon the amount and type of product purchased, the employer's sales volume and, to some extent, the buyers' seniority. Buyers for discount department stores and other mass merchandisers and those who buy centrally for large chain department stores are among the most highly paid. Most buyers earned between $19,000 and $28,000 a year in 1980.

Buyers often earn cash bonuses based on their performance. In addition, many stores have incentive plans, such as profit sharing and stock options.

## Related Occupations

Workers in other occupations who need a knowledge of marketing and the ability to assess consumer demand are sales managers, comparison shoppers, manufacturers' sales representatives, insurance sales agents, wholesale trade sales representatives, and travel agents.

## Sources of Additional Information

General information about a career in retailing is available from:

National Retail Merchants Association, 100 West 31st St., New York, N.Y. 10001.

Information on schools that teach retailing is available from:

U.S. Department of Education, Division of Vocational/Technical Education, Washington, D.C. 20202.

National Association of Trade and Technical Schools, 2021 K St. NW., Washington, D.C. 20006.

# City Managers

(D.O.T. 188.117-114)

## Nature of the Work

Population growth and industrial expansion place increasing pressure on housing, transportation, recreation, and other facilities of cities. Problems associated with the growth of modern communities, such as air and water pollution and rising crime rates, also demand attention. To cope effectively with these problems, many communities hire a specialist in management techniques—the city manager.

A city manager usually is appointed by the community's elected officials and is responsible directly to them. Although duties vary by city size, city managers generally administer and coordinate the day-to-day operations of the city. They are responsible for functions such as tax collection and disbursement, law enforcement, and public works. They also hire department heads and their staffs and prepare the annual budget to be approved by elected officials. In addition, they study current problems, such as housing, traffic congestion, or crime, and report their findings to the elected council.

City managers must plan for future growth and development of cities and surrounding areas. To provide for an expansion of public services, they frequently appear at civic meetings to advocate certain programs or to inform citizens of current government operations.

City managers work closely with planning departments to coordinate new and existing programs. In smaller cities that have no permanent planning staff, coordination may be done entirely by the manager.

To aid the city manager, many cities employ *management assistants*: Assistant city managers, department head assistants (D.O.T. 189.167-030), administrative assistants (D.O.T. 169.167-010), and management analysts (D.O.T. 161.167-010). Under the manager's direction, management assistants administer programs, prepare reports, receive visitors, answer correspondence, and generally help to keep the city government functioning smoothly. Assistant city managers organize and coordinate city programs, supervise city employees, and act for the city manager on occasion. They also may assume responsibility for some projects, such as the development of a preliminary annual budget. Department head assistants generally are responsible for one activity, such as personnel, finance, or law enforcement, but they also may assist in other areas. Administrative assistants, also called executive assistants or assistants to the city manager, usually do administrative and staff work in all departments under the city manager. For instance, they may compile operating statistics or review and analyze work procedures. Management analysts study and recommend possible changes in organization or administrative procedures.

## Working Conditions

City managers generally work in well-lighted and well-ventilated offices. They often work overtime at night and on weekends meeting with individuals and citizens' groups, attending civic functions, reading and writing reports, or finishing paperwork. When a problem arises or a crisis occurs, they may be called to work at any hour.

## Employment

About 3,300 city managers were employed in 1980, according to the International City Management Association. In addition, several times as many persons worked as administrative assistants, department head assistants, and assistant city managers. Most city managers work for cities and counties that have a council-manager form of government. Under this type of government, an elected council appoints a manager who is responsible for the day-to-day operation of the government as well as for the hiring and firing of assistants, department heads, and other staff. Many other city managers work for municipalities that have the mayor-council form of government, in which the mayor appoints the city manager as the chief administrative officer. A few city managers work for county governments, metropolitan or regional planning organizations, and councils of governments. All types of local governments employ management assistants, but larger jurisdictions generally employ them in greater numbers.

Although about four-fifths of all city managers work for cities having fewer than

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25,000 inhabitants, many larger cities also employ a city manager. Over one-half of the cities having between 10,000 and 500,000 inhabitants have city managers.

## Training, Other Qualifications, and Advancement

A master's degree, preferably in public or business administration, is essential for those seeking a career in city management. Although some applicants with only a bachelor's degree may find employment, strong competition for positions, even among master's degree recipients, makes the graduate degree a requirement for most entry level jobs. In some cases, employers may hire a person with a graduate or professional degree in a field related to public administration, such as political science, planning, or law.

In 1980, over 200 colleges and universities offered graduate degrees in public affairs or administration. Degree requirements in some schools include completion of an internship program in a city manager's office. During this internship period, which may last from 6 months to a year, the degree candidate observes local government operations and does research under the direct supervision of the city manager.

Nearly all city managers begin as management assistants. Most new graduates work as management analysts or administrative assistants to city managers for several years to gain experience in solving urban problems, coordinating public services, and applying management techniques. Others work in a government department such as finance, public works, or public planning. They may acquire supervisory skills and additional experience by working as assistant city manager or department head assistant. At least 5 years of experience are generally required to compete for the job of city manager. City managers often are first employed in small cities, but during their careers they may work in several cities of increasing size.

Persons who plan a career in city management should like to work with detail and to be a part of a team. They must have sound judgment, self-confidence, and the ability to perform well under stress. To handle emergencies, city managers must quickly isolate problems, identify their causes, and provide a number of possible solutions. City managers should be tactful and able to communicate and work well with people.

City managers also must be dedicated to public service since they often put in long, hard hours in times of crisis.

## Job Outlook

Employment of city managers and local government management assistants is expected to expand about as fast as the average for all occupations through the 1980's as local government management becomes increasingly complex. Examples of more sophisticated management techniques include computerized tax and utility billing, electronic traffic control, and application of systems analysis to urban problems. The demand for city managers also will increase as more cities convert to the council-manager form of government, currently the fastest growing form of city government. Furthermore, city managers and management assistants will be employed by other types of local government to help elected officials with day-to-day operations of government. Increased emphasis on regional solutions to urban problems also should result in additional job opportunities for city managers and management assistants in councils of government.

City managers generally begin their careers as management analysts or assistants.

Population growth in the South and West may create particularly strong demand for additional city managers and assistants in those regions. Growth of small communities that have council-manager forms of government also may result in additional job opportunities throughout the Nation.

Persons who seek beginning management assistant jobs are expected to face keen competition through the 1980's, however, as the number of qualified applicants greatly exceeds the number of job openings. Competition also should be keen among the growing number of administrative assistants, department head assistants, and assistant city managers for the relatively few city manager positions.

## Earnings

Salaries of city managers and management assistants vary according to experience, job responsibility, and city size. In 1980, the average annual salary for all managers was more than $33,000. Average annual salaries of city managers ranged from about $28,000 in small cities of 5,000 to 10,000 inhabitants to about $49,000 in medium-sized cities of 50,000 to 100,000 inhabitants, according to the International City Management Association. City managers employed in large cities of 500,000 to 1 million inhabitants earned more than $70,000 a year. City managers in cities not having council-manager governments received slightly less.

Salaries of management assistants ranged from about $18,000 in small cities to more than $25,000 in large ones. Salaries of assistant city managers generally were higher than those of other management assistants.

## Related Occupations

A variety of related careers are open to persons interested in managerial work. In the private sector, managerial and executive careers in business and industry cover a wide range. In the public sector, related managerial occupations include: Program analysts, government program managers, management analysts, budget officers, school or hospital administrators, and airport managers.

## Sources of Additional Information

For information about city management

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positions, contact the personnel offices of local governments in your area.

Information on education for public management careers is available in *Programs in Public Affairs and Administration*, a directory that contains data on the academic content of programs, the student body, the format of instruction, and other information. The directory may be purchased for $10 from:

National Association of Schools of Public Affairs and Administration, 1225 Connencticut Ave. NW., Suite 306, Washington, D.C. 20036.

# College Student Personnel Workers

(D.O.T. 045.107-010, -018, -026, -038; 090.107-010, .117-018, -022, -030, .167-014, -022, -030; 129.107-018; 166.167-014; 169.267-018, -026)

## Nature of the Work

Many factors influence a student's choice of an institution of higher education. Availability of a specific educational program, quality of the school, cost, size, and location all may play important roles. For many students, another important factor is the institution's ability to provide for their housing, social, cultural, and recreational needs. Developing and administering these services are the tasks of college student personnel workers.

The dean of students and the director of student affairs are probably the best known. But there are many aspects to student personnel administration, and those in the field represent a number of specialties. Student personnel workers are responsible for student housing, religious life, counseling, health, athletics, financial aid, on-campus and summer employment, career counseling and placement, learning assistance, skills development, and cultural activities. On many campuses, they provide special services for veterans, and for women, minority, handicapped, and foreign students. Their duties also include the student union, bookstore, and campus security.

Job titles vary from institution to institution, from program to program within a single school, and with the level of responsibility within a student personnel program. The more common titles are dean, director, officer, associate dean, assistant director, and adviser.

The *dean of students* (D.O.T. 090.117-018) heads the entire student personnel program; associate or assistant deans may be in charge of specific programs, such as student life or housing. At some schools, another title is used, such as *vice-president for student affairs* or *vice-chancellor for student affairs*. Planning is an important part of the dean's job; planning includes evaluating the changing needs of students and helping develop institutional policies. For example, to meet the needs of older, part-time students—many of them women who support families—colleges and universities have been changing their policies on student housing, financial aid, and counseling. And an increase in the number of handicapped students on college campuses has stimulated still other changes in student services.

The *director of student affairs* (D.O.T. 090.167-022) manages the student union and assists student groups in planning and arranging social, cultural, and recreational activities. Student activities staff assist in the orientation of new students; advise fraternities, sororities, and other social groups; and promote student participation in cultural and recreational pursuits. They usually publish a student handbook and a calendar of student activities. Their responsibility for the student union includes the building's physical facilities as well as the services it provides.

The *director of residence life* oversees all aspects of student housing, including such operational matters as room selection and assignments; damage control and residence hall inventory; and liaison with other departments on recordkeeping, billing, and building maintenance. Developing and coordinating cultural, educational, recreational, and social activities for residents is another major area of responsibility; in large colleges and universities, this is handled by an assistant director. *Residence counselors* (D.O.T. 045.107-038) live in the dormitories and, in general, help the students to live together in harmony. They may counsel students who have personal problems. Student housing staff may also manage the fiscal, food service, and housekeeping operations of student residences.

The *director of religious activities* (D.O.T. 129.107-018) coordinates the activities of the various denominational groups on campus and advises them on ways to promote spirtual growth and interfaith understanding. Counseling on marital, health, financial, or religious problems is an important part of the job.

The *director of counseling* (D.O.T. 045.107-018) supervises *counselors* (D.O.T. 045.107-010), *counseling psychologists* (D.O.T. 045.107-026), graduate students, interns, and other staff who help students with personal, educational, and vocational problems. Students may come to the counseling center on their own or be referred by a faculty member, a residence hall counselor, or a friend. Counseling needs may arise from lack of self-confidence or motivation on the part of the student, failure in academic work, desire to leave college or transfer to another college, inability to get along with others, loneliness, drug abuse, or marriage problems. On many campuses, counselors try to reach more students by establishing group sensitivity sessions and telephone "hotlines." Counselors often administer tests that indicate aptitudes and interests to students having trouble understanding themselves. Counseling center staff may also teach or assist with admissions, orientation, and training of residence hall staff. For further information on this field, see the statement on psychologists elsewhere in the *Handbook*.

*Foreign student advisers* (D.O.T. 090.107-010) administer and coordinate many of the services that help to insure a successful academic and social experience for students from other countries. They assist with admissions, orientation, financial aid, housing, English as a foreign language, academic and personal counseling, student-community relationships, job placement, and alumni relations. In addition, they may work as advisers for international associations and nationality groups and for U.S. students in

Financial aid counselor advises student about applying for a loan.

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terested in study, educational travel, work, or service projects abroad.

*Veterans coordinators* (D.O.T. 169.267-026) provide information and services to veterans and potential military enlistees. They advise students on their eligibility for veterans benefits or other forms of assistance, interpret laws and regulations to students, and supervise the processing of applications for benefits.

*Student health service directors* are responsible for planning and administering the college or university student health program. They arrange for facilities and equipment, recruit and hire staff, prepare budgets and authorize expenditures, and plan programs and services that respond to student needs. For example, the student health service might organize health awareness seminars, provide health counseling, or set up a rape crisis center.

*Athletic directors* (D.O.T. 090.117-022) administer intercollegiate athletic activities. They hire and discharge coaches, schedule sports events, and direct publicity efforts. They also prepare the budget and authorize expenditures by the athletic department.

*Financial aid officers* (D.O.T. 090.117-030) help students obtain financial support for their education. They direct a staff of *financial aid counselors* (D.O.T. 169.267-018) who advise students about their eligibility for various forms of financial aid: Scholarships, grants, loans, work/study, teaching or research assistantships, and campus jobs. In some colleges and universities, the financial aid office maintains jobs listings for the benefit of students who want or need to work. Often, they enlist the support of alumni in identifying job possibilities.

The *director of placement* (D.O.T. 166.167-014), sometimes called the college placement officer, assists students in career exploration and advises them on job search strategies. The placement office may arrange for prospective employers to visit the campus to discuss personnel needs and interview students. The work is described in more detail in the statement on college career planning and placement counselors, elsewhere in the *Handbook*.

Admissions and records are closely related to student personnel administration, although admissions officers and registrars normally report to the dean of academic affairs, not to the dean of students.

The *director of admissions* (D.O.T. 090.167-014) directs the work of admissions officers, who interview and evaluate prospective students and process their applications. They may travel widely to recruit high school students and adult learners. "Talent search" programs that identify and recruit bright and talented students are the responsibility of the admissions office, which works closely with faculty, administrators, financial aid personnel, and public relations staffs to determine policies for recruiting and admitting students.

The *registrar* (D.O.T. 090.167-030) directs and coordinates college and university registration activities. The registrar's office prepares class schedules, coordinates schedules with room assignments, prepares transcripts of students' academic records, and provides enrollment and other statistical data to government and educational agencies.

## Working Conditions

Students are not always available during the day, so student personnel workers often work evenings and weekends. And since the workflow at a college may be irregular, they sometimes face hectic periods where they work more than 40 hours a week. Registrars, for example, are especially busy during the weeks immediately preceding and including registration, while admissions counselors may work long hours in early spring, as the deadline for determining next year's student body approaches.

Employment in these occupations usually is on a 12-month basis. In most schools, college student personnel workers are entitled to pensions, life and health insurance, sabbaticals, and other fringe benefits.

## Employment

An estimated 55,000 persons were employed in college student personnel administration in 1980. Every college and university has a staff responsible for student life, even though they are not always organized as a unified program. Large colleges and universities generally have specialized staffs for each personnel function. In many small colleges, a few persons may carry out the entire student personnel program.

## Training, Other Qualifications, and Advancement

Because of the diversity in duties, the education and backgrounds of college student personnel workers vary considerably. In filling entry-level jobs, schools often prefer persons who have a bachelor's degree in a social science, such as economics or history, and a master's degree in student personnel administration. In 1980, nearly 400 colleges and universities offered graduate programs in this area.

Some student personnel occupations require specialized training. A master's degree in counseling or in clinical or counseling psychology usually is required for work as a college counselor; counseling psychologists need a doctoral degree. Directors of religious life usually are members of the clergy. Familiarity with information systems is an asset for work in admissions, records, or financial aid.

Previous experience in college administration is desirable. Indeed, the best training may be on-the-job. Many graduate students obtain experience by working part time in residence halls or in financial aid or admissions offices, sometimes as part of a work/study program. Participation in student government as an undergraduate also provides useful exposure.

Student personnel administration requires leadership and organizational skills, commitment to the purpose of the institution, and a desire to serve. College student personnel workers must be especially good at working with people. Individuals in this field need the patience to cope with conflicting viewpoints and the emotional stability to deal with the unexpected and the unusual. The ability to function under pressure is essential.

Entry level positions include student activities advisers, student union staff, admissions counselors, financial aid counselors, residence hall counselors, and counseling center staff. A master's degree is preferred and a doctoral degree may be necessary for advancement to top positions.

Some of the more responsible positions in the field are filled by individuals who have developed organizational and interpersonal skills in other fields, including philanthropy, business, and social services. The ministry provides a congenial background, too.

## Job Outlook

The employment outlook for college student personnel workers is likely to be competitive through the 1980's. Most openings will result from the need to replace personnel who transfer to other positions, retire, or leave the field for other reasons. Tightening budgets and declining enrollments in 4-year colleges and universities are expected to affect employment in those institutions. Some staff reductions are likely. Although enrollments in 2-year and community colleges have been rising, these are commuter institutions, for the most part, and they put somewhat less emphasis on student life.

The various student personnel functions will not be affected equally by staff cuts, however. Positions least likely to be eliminated are those in admissions and financial aid, while positions in counseling and other student services will be susceptible to cutbacks. Some positions are likely to be lost as people leave; the job may be eliminated altogether or the duties assumed by faculty or other administrative staff. In counseling centers, greater reliance may be placed on interns and graduate assistants.

## Earnings

According to the College and University Personnel Association, median annual salaries for selected college student personnel positions were as follows in 1980-81: $28,050 for athletic directors, $24,700 for counseling directors, $24,611 for admissions directors, $23,151 for registrars, $21,924 for student health services directors, $21,600 for student union directors, $20,733 for financial aid directors, $20,671 for placement directors, and $19,117 for housing directors. Salaries vary greatly, however, depending on geographic location, budget, source of support, and the size of the school.

## Related Occupations

College student personnel workers administer programs which directly affect the wel-

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fare of students. Their jobs, which are very much people-oriented, have counterparts in private industry, government, and elementary and secondary schools. Some of these occupations include: personnel managers, education and training managers, credit counselors, public relations representatives, government contact representatives, principals, or school counselors.

# Construction Inspectors (Government)

(D.O.T. 168.167-030, -034, -038, -046, and -050)

## Nature of the Work

Federal, State, and local government construction inspectors examine the construction, alteration, or repair of highways, streets, sewer and water systems, dams, bridges, buildings, and other structures to insure compliance with building codes and ordinances, zoning regulations, and contract specifications. Construction inspectors generally specialize in one particular type of construction work. Broadly categorized, these are building, electrical, mechanical, and public works. Inspectors usually work alone on small jobs, but several may be assigned to a large, complex project.

*Building inspectors* inspect the structural quality of buildings. Some may specialize, for example, in structural steel or reinforced concrete buildings. Before construction, inspectors determine whether the plans for the building or other structure comply with local zoning regulations and are suited to the engineering and environmental demands of the building site. They visit the worksite before the foundation is poured to inspect the positioning and depth of the footings. They inspect the foundation after it has been completed. The size and type of structure and the rate of completion determine the number of other visits they must make. Upon completion of the project, they conduct a final comprehensive inspection.

*Electrical inspectors* inspect the installation of electrical systems and equipment to insure that they work properly and are in compliance with electrical codes and standards. They visit worksites to inspect new and existing wiring, lighting, sound and security systems, and generating equipment. They also may inspect the installation of the electrical wiring for heating and air-conditioning systems, kitchen appliances, and other components.

*Mechanical inspectors* examine plumbing systems including septic tanks; plumbing fixtures and traps; and water, sewer, and vent lines. They also inspect the installation of the mechanical components of kitchen appliances, heating and air-conditioning equipment, gasoline and butane tanks, gas piping, and gas-fired appliances. Some specialize in inspecting boilers, mechanical components, or plumbing.

*Public works inspectors* insure that Federal, State, and local government construction of water and sewer systems, highways, streets, bridges, and dams conforms to detailed contract specifications. They inspect excavation and fill operations, the placement of forms for concrete, concrete mixing and pouring, and asphalt paving. They also record the amount of work performed and materials used so that contract payment calculations can be made. Public works inspectors may specialize in inspection of highways, reinforced concrete, or ditches.

While inspections are primarily visual, inspectors often use tape measures, metering devices, concrete strength measurers, and other test equipment during inspections. They often keep a daily log of their work, take photographs, file written reports, and, if necessary, act on their findings. For example, construction inspectors notify the construction contractor, superintendent, or supervisor when they discover a detail of a project that is not in compliance with the appropriate codes, ordinances, or contract specifications. If the deficiency is not corrected within a reasonable period of time, they have authority to issue a "stop-work" order.

Many inspectors also investigate reported incidents of "bootlegging," construction or alteration that is being carried on without proper permits. Violators of permit laws are directed to obtain permits and submit to inspection.

Construction inspectors must be familiar with building codes and ordinances.

## Working Conditions

Construction inspectors work indoors and out. They spend about half their time in an office reviewing blueprints, answering letters or telephone calls, writing reports, and scheduling inspections. The rest of their time is spent traveling to construction sites—usually in a government car—and making inspections.

Inspection sites may be dirty and cluttered with tools, materials, or debris. Inspectors may have to climb ladders or several flights of stairs, or may have to crawl beneath buildings to make inspections. However, the work is not considered hazardous.

Inspectors normally work regular hours. However, in case of an accident at the construction site, such as a partially collapsed concrete structure, inspectors must respond immediately and may be expected to work irregular hours until a report has been completed.

Inspection work tends to be steady and year-round, unlike the seasonal and intermittent nature of employment in many of the occupations associated with the construction industry. When new construction slows, ren-

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ovation generally increases, helping construction inspectors to continue working full time.

## Employment

About 48,000 persons worked as government construction inspectors in 1980. About two-thirds worked for municipal or county building departments. Public works construction inspectors were employed primarily at the Federal and State levels.

The employment of local government construction inspectors is concentrated in cities and in suburban areas undergoing rapid growth. These governments employ large inspection staffs, including most of the inspectors who specialize in structural steel, reinforced concrete, and boiler inspection.

About one-half of the construction inspectors employed by the Federal Government in 1980 worked for the Department of Defense, primarily for the U.S. Army Corps of Engineers. Other Federal employers include the Tennessee Valley Authority and the Departments of Agriculture, Interior, and Transportation.

## Training, Other Qualifications, and Advancement

To become a construction inspector, several years of experience as a construction contractor, supervisor, or craft worker are generally required. Federal, State, and most local governments also require an applicant to have a high school diploma. High school preparation should include courses in drafting, algebra, geometry, and English.

Workers who want to become inspectors should have a thorough knowledge of construction materials and practices in either a general area like structural or heavy construction, or in a specialized area such as electrical or plumbing systems, reinforced concrete, or structural steel; a significant number of construction inspectors have recent experience as carpenters, electricians, plumbers, or pipefitters.

Many employers prefer inspectors to be graduates of an apprenticeship program, to have studied at least 2 years toward an engineering or architectural degree, or to have a degree from a community or junior college, with courses in construction technology, blueprint reading, technical mathematics, English, and building inspection.

Construction inspectors must be in good physical condition in order to walk and climb about construction sites. They also must have a motor vehicle operator's license. In addition, Federal, State, and many local governments usually require that construction inspectors pass a civil service examination.

Construction inspectors receive most of their training on the job. During the first couple of weeks, working with an experienced inspector, they learn about inspection techniques; codes, ordinances, and regulations; contract specifications; and recordkeeping and reporting duties. They begin by inspecting less complex types of construction such as residential buildings. The difficulty of their assignments is gradually increased until they are able to handle complex assignments. An engineering degree is frequently needed in order to advance to supervisory inspector.

Since they advise representatives of the construction industry and the general public on matters of code interpretation, construction practices, and technical developments, construction inspectors must keep abreast of new building code developments. The Federal Government and most State and large city governments conduct formal training programs for their construction inspectors to broaden their knowledge of construction materials, practices, and inspection techniques and to acquaint them with new materials and practices. Inspectors who work for small agencies that do not conduct training programs frequently can broaden their knowledge of construction and upgrade their skills by attending State-conducted training programs or by taking college or correspondence courses.

## Job Outlook

Employment of government construction inspectors is expected to grow about as fast as the average for all occupations through the 1980's. Because of the increasing complexity of construction technology and the trend toward the establishment of professional standards for inspectors by State governments, job opportunities should be best for those who have some college education or who are currently employed as carpenters, electricians, or plumbers.

In addition to growth needs, job openings for construction inspectors will occur each year to replace those who die, retire, or leave the occupation for other reasons.

The number of new positions for construction inspectors will be largely affected by the level of new housing and commercial building activity. Because construction activity is sensitive to ups and downs in the economy, the number of job openings may fluctuate from year to year. However, once employed, inspectors seldom experience layoffs which typically affect most occupations associated with construction.

The demand for construction inspectors also should increase as they are given more responsibility for insuring safe construction of prefabricated buildings mass-produced in factories and assembled on the construction site.

## Earnings

In 1980, most construction inspectors working for the Federal Government earned between $16,300 and $20,200 a year. The most experienced inspectors earned higher salaries. The average Federal salary was about $19,500.

According to limited information, salaries for inspectors working for State or local governments ranged from $12,000 to $22,000 a year, with top supervisors earning somewhat more than $22,000 a year. Salaries in the North and West are slightly higher than salaries in the South.

## Related Occupations

Construction inspectors combine a knowledge of law with their abilities to coordinate data, diagnose problems, and communicate with people to provide accurate inspections of construction sites. Other occupations involving a combination of similar skills are drafters, estimators, industrial engineering technicians, and surveyors.

## Sources of Additional Information

Persons seeking additional information on a career as a State or local government construction inspector should contact their State or local employment service or:

International Conference of Building Officials, 5360 South Workman Mill Rd., Whittier, Calif. 90601.

Persons interested in a career as a construction inspector with the Federal Government can get information from:

U.S. Office of Personnel Management, 1900 E St. NW., Washington, D.C. 20415.

# Credit Managers

(D.O.T. 168.167-054)

## Nature of the Work

Over the years, buying on credit has become a customary way of doing business. Consumers use credit to pay for houses, cars, appliances, and travel, as well as day-to-day retail purchases. Most business purchases, such as raw materials used in manufacturing and merchandise to be sold in retail stores, also are on credit.

For most forms of credit, a credit manager has final authority to accept or reject a credit application. In extending credit to a business (commercial credit), the credit manager or an assistant analyzes detailed financial reports submitted by the applicant, interviews a representative of the company about its management, and reviews credit agency reports to determine the firm's record in repaying debts. The manager also checks at banks where the company has deposits or previously was granted credit. In extending credit to individuals (consumer credit), detailed financial reports usually are not available. The credit manager must rely more on personal interviews and credit bureau and bank reports to provide information about applicants.

Particularly in large organizations, executive level credit managers work with other top managers to formulate a credit policy. They establish financial standards to be met by applicants, and thereby determine the amount of risk that their company will accept when offering its products or services for sale on credit. Managers must cooperate with the sales department in developing a credit policy liberal enough to allow the company's sales to increase and yet strict enough to deny

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Credit managers rely on personal interviews and information from banks and credit bureaus to evaluate credit applications.

credit to customers whose ability to repay their debts is questionable. Many credit managers establish office procedures and supervise workers who gather information, analyze facts, and perform general office duties in a credit department; they include application clerks, collection workers, bookkeepers, computer operators, and secretaries.

In small companies that handle a limited number of accounts, credit managers may do much of the work themselves. They may interview applicants, analyze information gained in the interview, and make the final approval. They frequently contact customers who are unable or refuse to pay their debts. If these attempts at collection fail, credit managers may refer the account to a collection agency or assign an attorney to take legal action.

## Working Conditions

Credit managers normally work the standard 35- to 40-hour workweek, but some may work longer hours. In wholesale and retail trade, for example, a seasonal increase in credit sales can produce a greater work volume.

Credit managers usually spend most of their time in the office. However, they may travel occasionally. Some credit managers, for example, attend conferences sponsored by industry and professional organizations in which they develop and discuss new techniques for credit department management.

## Employment

An estimated 55,000 persons worked as credit managers in 1980. About half were employed in wholesale and retail trade; most others worked for manufacturing firms and financial institutions.

Although credit is granted throughout the United States, most credit managers work in urban areas where many financial and business establishments are located.

## Training, Other Qualifications, and Advancement

A college degree is becoming increasingly important for entry level jobs in credit management. Employers usually seek persons who have a degree in business administration, but they may also hire graduates holding liberal arts degrees. Courses in accounting, economics, finance, computer programming, statistics, and psychology all are valuable in preparing for a career in credit management. Some employers promote high school graduates experienced in collection work or processing credit information to credit manager positions.

Newly hired workers normally begin as management trainees and work under the guidance of experienced personnel in the credit department. Here they learn the company's credit procedures and policies. They may analyze previous credit transactions to learn how to recognize which applicants prove to be good customers. Trainees also learn to deal with credit bureaus, banks, and other businesses which may have information on the past credit dealings of their customers.

Some formal training programs are available through associations that service the credit and finance field. This training includes home study, college and university programs, and other instruction to improve beginners' skills and keep experienced credit managers aware of developments in the field. Credit managers should be able to analyze detailed information and draw valid conclusions based on this analysis. Because it is necessary to maintain good customer relationships, a pleasant personality and the ability to speak and write effectively also are characteristics of the successful credit manager.

The work performed by credit managers allows them to become familiar with almost every phase of their company's business. Highly qualified and experienced managers can advance to top level executive positions.

## Job Outlook

Employment of credit managers is expected to grow more slowly than the average for all occupations through the 1980's. Nevertheless, many jobs will become available each year due to the need to replace persons who leave the occupation.

Anticipated increases in business and consumer purchases are expected to result in a greater use of credit in the future. However, several factors are expected to continue to limit growth in employment of credit managers. The use of computers for storing, retrieving, and processing information has enabled credit managers to evaluate applications for credit more efficiently. The use of telecommunications networks has enabled retail outlets to centralize credit operations. Businesses also will continue to reduce or eliminate their credit departments and rely on their customers using bank credit cards. These bank credit operations also maintain more efficient centralized operations.

## Earnings

In 1980, credit manager trainees who had a college degree earned annual salaries that ranged from about $12,000 to $14,000, depending on the type of employer and the geographic location of the job. Salaries of experienced credit managers averaged about $22,000 to $25,000 annually. Those in charge of large operations earned somewhat more.

## Related Occupations

Other managerial occupations in banks, investment companies, and credit agencies include loan officers, credit card operations managers, credit union managers, risk and insurance managers, and controllers.

## Sources of Additional Information

Information about a career in consumer credit may be obtained from:

National Retail Merchants Association, 100 West 31st St., New York, N.Y. 10001.

For information about training programs available in commercial credit, write:

National Association of Credit Management, 475 Park Ave. South, New York, N.Y. 10016.

# Health Services Administrators

(D.O.T. 070.101-046; 075.117-014, -018, -022; 169.167-010; 187.117-010, -018, -050, .167-034, -090; and 188.117-082)

## Nature of the Work

Medical and health care is provided by

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organizations that vary from large teaching hospitals to storefront clinics. It is the job of the health services administrator to provide effective management for these facilities under the general supervision of a board of directors or other governing body.

Administrators direct the various functions and activities that make a health organization run smoothly. They have overall responsibility for management decisions of many kinds: Budget preparation; establishing rates for health services; directing the hiring and training of personnel; and directing and coordinating the activities of the medical, nursing, physical plant, and other operating departments. They must also plan and negotiate for expansion of facilities and services to keep pace with requirements of the community. They may handle these matters alone if the organization is small, or, more commonly, direct a staff of assistant administrators. Even where assistant administrators direct daily operations of various departments, the chief executive keeps informed through formal and informal meetings with assistants, medical staff, and others.

Many health administrators also help carry out fundraising drives and promote public participation in health programs. This phase of the administrator's job often includes speaking before civic groups, arranging publicity, and coordinating the activities of the organization with those of government or community agencies.

Conferring with patients' relatives is part of the nursing home administrator's job.

## Working Conditions

Health administrators often work long hours. Facilities such as nursing homes and hospitals operate around the clock, and administrators may be called at all hours to settle emergency problems. Also, some may travel to meetings or, for those who oversee several facilities, to make inspections.

## Employment

About 220,000 persons worked in some phase of health administration in 1980. Most administrators work in patient care facilities, including hospitals, nursing homes, rehabilitation centers, home health agencies, and health maintenance organizations. Hospitals employ about half of all administrators; some of these work for the Federal Government in Veterans Administration, Public Health Service, and Armed Forces hospitals and clinics.

Some health administrators work for State and local health departments. Others work for voluntary health agencies that support medical research into the causes and treatment of particular diseases or impairments. These agencies also conduct professional and public education and community service programs. Still other health administrators are employed by consulting firms that provide management services for a fee.

## Training, Other Qualifications, and Advancement

A sound knowledge of management principles and practices is essential preparation for a career in health administration. Academic programs in health administration, leading to a bachelor's, master's, or doctoral degree, are offered by colleges, universities, and schools of public health. The various degree programs provide different levels of career preparation. The master's degree—in hospital administration, health administration, or public health—is regarded as the standard credential for many positions in this field.

Academic programs in health administration do not provide the only way of entering this career area, however. A degree in such fields as business, personnel administration, or public administration provides an appropriate background for some positions. And for others, institutional management capability is the key qualification. Educational requirements vary with the size of the organization and the amount of responsibility involved. Generally, larger organizations require more specialized academic preparation than smaller ones do.

In 1980, about 100 colleges and universities offered bachelor degree programs in health services administration. About 70 schools had programs leading to the master's degree in hospital or health services administration; 21 of these programs were in schools of public health. Some schools offer joint degree programs, leading to a master's in public health and a master's in business administration, for example.

To enter graduate programs, applicants must have a bachelor's degree, with courses in natural sciences, psychology, sociology, statistics, accounting, and economics. Competition for entry to these programs is keen, and applicants need above-average grades to gain admission. The programs generally last about 2 years and may include some supervised administrative experience in hospitals, clinics, or health agencies. Programs may include courses such as hospital organization and management, accounting and budget control, personnel administration, public health administration, and the economics of health care.

New graduates with master's degrees in health or hospital administration may be hired by hospitals as associate or assistant administrators, department heads, or project directors, while those with master's degrees in public health often find work as program analysts or program representatives in public health departments. Very few master's degree recipients take entry level administrative positions in nursing or personal care homes, although many nursing home administrators pursue graduate education while employed. New master's degree recipients from related disciplines such as public administration or business are sometimes hired for administrative jobs in the health field. Master of business administration (MBA) graduates, for example, are sometimes hired by public health departments as program analysts.

New recipients of bachelor's degrees in health administration usually begin their careers as administrative assistants or department heads in hospitals, or as assistant administrators in small hospitals or in nursing homes.

The Ph.D. degree usually is required for positions in teaching or research, and is an asset for those seeking administrative jobs in larger, more prestigious health organizations. Although some public health departments still require chief administrators to be physicians, the trend is away from this. Directors of nursing are usually chosen from among supervisory registered nurses with administrative abilities.

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Administrators in Armed Forces hospitals usually are career military personnel who generally hold graduate degrees in health services administration.

As a rule, licensure is not required in most areas of health services administration, with the exception of nursing home or long-term care administration. All States and the District of Columbia require these administrators to pass a qualifying licensing examination, and most students prepare for it by completing a special course of study. These preparatory courses, usually consisting of 100 to 200 hours of study in long-term care administration, are available through some colleges, universities, and home study programs. The licensing examination covers principles of administration; management of a long-term care facility; the role of government in long-term care; environmental health and safety; and medical, psychological, and social aspects of patient care. Nearly half the States require applicants to complete an internship known as an Administrator-in-Training program before taking the licensure examination. This internship generally lasts 1 year and is supervised by a licensed administrator. Since requirements vary from State to State, persons considering a career in long-term care administration should investigate licensing requirements where they wish to work.

Health services administrators are often responsible for millions of dollars of facilities and equipment and hundreds of employees. They need a command of business and communication skills that allows them to make timely policy decisions and to motivate subordinates to implement those decisions. Administrators, especially head administrators, of all types of health organizations need to be self-starters.

In order to create an atmosphere favorable to good patient care, administrators must like people, enjoy working with them, and be able to deal effectively with them. Administrators also should be good at public speaking.

Health administrators advance in the profession by moving into more responsible and higher paying positions. They may do this within their own institution, or by shifting to another health care facility or organization. Frequently, the administrator's first job in a large institution is a position that is somewhat narrow in scope—department head in charge of purchasing, for example. Advancement occurs with promotion to successively more responsible jobs such as assistant or associate administrator and finally chief administrator. Less commonly, hospital administrators begin their careers in small hospitals in positions with broad responsiblities, such as assistant administrator. Regardless of the path of advancement chosen, the ultimate occupational goal in hospitals and nursing homes is the position of chief executive or chief administrative officer.

## Job Outlook

The number of graduate programs in health administration has increased rapidly in recent years; in addition, administrative specialists with graduate degrees in other fields are entering the profession. Consequently, competition for jobs has intensified, particularly in hospital administration. This situation is expected to continue, and it may become difficult for persons with less than a graduate education to obtain administrative jobs in hospitals. In nursing homes and other long-term care facilities, where a graduate degree in health administration is not ordinarily a requirement, job opportunities will be good for individuals with a business or management background.

Employment of health services administrators is expected to grow faster than the average for all occupations through the 1980's as the health industry expands and health services management becomes more complex. Not all areas of health care will experience identical rates of growth, however. Population migration has caused the closing of some hospitals where population is declining and the opening of hospitals in areas of population growth—notably in the South and West. Overall, however, hospital administration may not contribute heavily to employment opportunities for health administrators in the coming years. Although hospitals have been growing in size and increasing the scope and sophistication of their services, the number of hospitals is decreasing. Demand for administrators will be stimulated, however, by the formation of group medical practices and health maintenance organizations. Administrators also will be needed in nursing and convalescent homes to handle the increasing amount of administrative work expected as these facilities expand. Job openings also will result from the need to replace personnel who transfer to another field, retire, or die.

## Earnings

Salaries of hospital administrators depend on factors such as the level of job responsibility; the size, type, and location of the hospital; and the size of its administrative staff and budget.

Chief administrators in State hospitals with 350 to 800 beds earned an average of $35,000 a year in 1980. Some, in larger hospitals, earned over $50,000. Recent recipients of master's degrees in health administration starting work in Veterans Administration hospitals earned $18,585 a year in 1980. The average salary paid administrators of Federal hospitals was $34,100.

Commissioned officers in the Armed Forces who work as hospital administrators hold ranks ranging from second lieutenant to colonel or from ensign to captain. Commanding officers of large Armed Forces hospitals are generally physicians, who may hold higher ranks. Hospital administrators in the U.S. Public Health Service are commissioned officers holding ranks equivalent to those of lieutenant (junior grade) through captain in the Navy.

Administrators of nursing and personal care homes usually earn lower salaries than those paid hospital administrators in facilities having similar numbers of beds. Most administrators employed by voluntary health agencies earned between $25,000 and $40,000 a year in 1980, and some earned well over $50,000 annually.

## Related Occupations

Health services administrators plan programs, set policies, and make decisions for a health service agency or institution. Other administrators with similar responsibilities include social welfare administrators, emergency medical services coordinators, community organization directors, college or university department heads, medical-record administrators, and recreation superintendents.

## Sources of Additional Information

Information about health administration and the academic programs in this field offered by universities, colleges, and community colleges is available from:

American College of Hospital Administration, 840 North Lake Shore Dr., Chicago, Ill. 60611.

Association of University Programs in Health Administration, One Dupont Circle, NW., Washington, D.C. 20036.

National Health Council, Health Careers Program, 70 West 40th St., New York, N.Y. 10019.

American College of Nursing Home Administrators, 4650 East-West Hwy., Washington, D.C. 20014.

# Health and Regulatory Inspectors (Government)

(D.O.T. 073.264-010; 079.117-018; 160.167- 046; 168.167-022, -026, -042, -062, and -074; .264-010; .267-018, -022, and -042 through -078, except -070; .287; .387-010; 169.284-010; and 379.364-010)

## Nature of the Work

Protecting the public from health and safety hazards, prohibiting unfair trade and employment practices, controlling immigration, and raising revenue are responsibilities of government. Health and regulatory inspectors enforce the laws and regulations that govern these responsibilities. For discussion of another type of inspector, see the statement on construction inspectors (Government) elsewhere in the *Handbook*.

The duties, titles, and responsibilities of Federal, State, and local health and regulatory inspectors vary widely. Some types of inspectors work only for the Federal Government while others also are employed by State and local governments.

**Health Inspectors**. Health inspectors work with engineers, chemists, microbiologists, and health workers to insure compliance with public health and safety regulations govern-

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ing food, drugs, cosmetics, and other consumer products. They also administer regulations that govern the quarantine of persons and products entering the United States from foreign countries. The major types of health inspectors are: Consumer safety, food, agricultural quarantine, and environmental health inspectors. In addition, some inspectors work in a field closely related to food inspection—agricultural commodity grading.

Most *consumer safety inspectors* specialize in food, feeds and pesticides, weights and measures, or drugs and cosmetics inspection. Some are proficient in several areas. Working individually or in teams under a senior or supervisory inspector, they periodically check firms that produce, handle, store, and market food, drugs, and cosmetics. They look for inaccurate product labeling, and for decomposition or chemical or bacteriological contamination that could result in a product becoming harmful to health. They assemble evidence of violations, using portable scales, cameras, ultraviolet lights, container sampling devices, thermometers, chemical testing kits, and other equipment. They send product samples collected as part of their examinations to laboratories for analysis.

After completing their inspection, inspectors discuss their observations with plant managers or officials and point out areas where corrective measures are needed. They write reports of their findings, and, when necessary, compile evidence that may be used in court if legal action must be taken to enforce the law.

Federal and State laws empower *food inspectors* to inspect meat, poultry, and their byproducts to insure that they are wholesome and safe for public consumption. Working as part of a constant onsite team under a veterinarian, they inspect meat and poultry slaughtering, processing, and packaging operations. They also check for correct product labeling and proper sanitation.

*Agricultural quarantine inspectors* protect American agricultural products from the introduction and spread of foreign plant pests and animal diseases. To safeguard crops, forests, gardens, and livestock, they inspect ships, aircraft, railroad cars, and motor vehicles entering the United States for restricted or prohibited plant or animal materials.

*Environmental health inspectors*, or sanitarians, who work primarily for State and local governments, insure that food, water, and air meet government standards. They check the cleanliness and safety of food and beverages produced in dairies and processing plants, or served in restaurants, hospitals, and other institutions. They often examine the handling, processing, and serving of food for compliance with sanitation rules and regulations. They oversee the treatment and disposal of sewage, refuse, and garbage. They examine places where pollution is a danger, test for pollutants, and collect air or water samples for analysis. They determine the nature and cause of the pollution; then initiate action to stop it.

In large local and State health or agriculture departments, environmental health inspectors may specialize in milk and dairy products, food sanitation, waste control, air-pollution, institutional sanitation, or occupational health. In rural areas and small cities, they may be responsible for a wide range of environmental health activities.

*Agricultural commodity graders* apply quality standards to insure that retailers and consumers receive wholesome and reliable products. They generally specialize in an area such as eggs and egg products, processed or fresh fruits and vegetables, grain, or dairy products. They inspect product samples to determine quality and grade, and issue official grading certificates. Graders also may inspect the plant and equipment to insure that sanitation standards are maintained.

**Regulatory Inspectors**. Regulatory inspectors insure compliance with laws and regulations that protect the public welfare. Important types of regulatory inspectors are: Immigration; customs; air safety; occupational safety and health; mine; wage-hour compliance; and alcohol, tobacco, and firearms inspectors.

*Immigration inspectors* interview and examine people seeking to enter the United States. They inspect passports to determine whether people are legally eligible to enter and to verify their citizenship, status, and identity. Immigration inspectors also prepare reports, maintain records, and process applications and petitions for immigration or temporary residence in the United States.

*Customs inspectors* enforce laws governing imports and exports. Stationed at airports, seaports, and border crossing points, they count, weigh, gauge, measure, and sample commercial cargoes entering and leaving the United States to determine the amount of tax that must be paid. They also inspect baggage and articles worn by passengers and crew members to insure that all merchandise is declared and proper taxes are paid.

*Air safety inspectors* insure that Federal Aviation Administration (FAA) regulations which govern the quality and safety of aircraft equipment and personnel are maintained. Air safety inspectors may inspect aircraft manufacturing, maintenance and repair, or operations procedures. They usually specialize in either commercial or general aviation aircraft. They also certify aircraft pilots, pilot examiners, flight instructors, schools, and instructional materials.

*Occupational safety and health inspectors* visit places of employment to detect unsafe or unhealthy working conditions. They inspect machinery and equipment and observe employees at work to check that safety equipment and proper safety precautions are in use in accordance with Federal, State, or local government safety standards and regulations.

Occupational safety and health inspectors usually visit a plant, factory, or other workplace in response to a complaint or an accident. In reports of their findings, they describe hazards, and cite safety standards or regulations that have been violated. They also discuss their findings with the employer or plant manager and urge that violations be promptly corrected. Workers in the private sector who have related responsibilities are discussed in the statement on occupational safety and health workers elsewhere in the *Handbook*.

*Mine inspectors* work to insure the health and safety of miners. They visit mines and related facilities to obtain information on health and safety conditions and to enforce safety laws and regulatons.

Mine inspectors discuss their findings with the management of the mine, write reports of their findings and decisions, and issue notices that describe violations and hazards that must be corrected. They also investigate and report on mine accidents and direct rescue and fire-fighting operations when fires or explosions occur.

*Wage-hour compliance inspectors* inspect employers' time, payroll, and personnel records to insure compliance with Federal laws on minimum wages, overtime, pay, employment of minors, and equal employment opportunity. They often interview employees to verify the employer's records and to check for complaints.

*Alcohol, tobacco, and firearms inspectors* inspect distilleries, wineries, and breweries; cigar and cigarette manufacturing plants; wholesale liquor dealers and importers; firearms and explosives manufacturers, dealers, and users; and other regulated facilities. They insure compliance with revenue laws and other regulations on operating procedures, unfair competition, and trade practices, and determine that appropriate taxes are paid.

Consumer safety inspectors make periodic checks.

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## Working Conditions

Most health and regulatory inspectors live an active life; they meet many people and work in a variety of environments. Their jobs often involve considerable fieldwork, and some inspectors travel frequently. They are furnished with an automobile or reimbursed for travel expenses.

At times, inspectors have unfavorable working conditions. For example, food, and alcohol, tobacco, and firearms inspectors frequently come in contact with strong, unpleasant odors. Mine inspectors often work in mines where they are exposed to the same hazards as miners. Many inspectors work long and often irregular hours.

## Employment

About 112,000 persons worked as health and regulatory inspectors in 1980. Employment was nearly evenly divided among the three levels of government—Federal, State, and local. The largest single employer of consumer safety inspectors is the U.S. Food and Drug Administration, but the majority work for State governments. Most food inspectors and agricultural commodity graders in processing plants are employed by the U.S. Department of Agriculture. Agricultural quarantine inspectors work for the U.S. Public Health Service or the U.S. Department of Agriculture. Most environmental health inspectors work for State and local governments.

Most Federal regulatory inspectors work in regional and district offices throughout the United States. Air safety inspectors work for the Federal Aviation Administration; wage-hour compliance officers, for the Department of Labor; and alcohol, tobacco, and firearms inspectors, for the Treasury Department. Occupational safety and health inspectors and mine inspectors also work for the Department of Labor, as well as many State governments. Like agricultural quarantine inspectors, immigration and customs inspectors work at U.S. airports, seaports, and border crossing points, and at foreign airports and seaports. Immigration inspectors are employed by the Department of Justice. Customs inspectors work for the Treasury Department.

## Training, Other Qualifications, and Advancement

Because of the wide range of inspector jobs, qualifications for employment vary greatly. The Federal Government requires a passing score on the Professional and Administrative Career Examination (PACE) for several inspector occupations, including immigration; customs; wage-hour compliance; alcohol, tobacco, and firearms; occupational safety and health; and consumer safety inspectors. To take this examination, an applicant must have a bachelor's degree, 3 years of responsible work experience, or a combination of the two. In most cases, agencies prefer applicants whose course work or experience is related to the job.

Food inspectors must have related experience and pass an examination based on specialized knowledge.

Air safety inspectors must have considerable experience in aviation maintenance, and an FAA Air Frame and Power Plant certificate. In addition, pilot certificates and considerable flight experience are required. Many air safety inspectors have had flight training and mechanical training in the Armed Forces. No written examination is required.

Applicants for mine safety inspector positions generally must have experience in mine safety, management, or supervision, or possess a skill such as electrical engineering (for mine electrical inspectors). In some cases, a general aptitude test may be required.

Some Civil Service registers, including those for agricultural quarantine inspectors and agricultural commodity graders, rate applicants solely on their experience and education and require no written examination.

Qualifications usually are similar for inspectors at the State and local level. Environmental health inspectors, called sanitarians in many States, usually must have a bachelor's degree in environmental health or the physical or biological sciences. In 35 States, they are licensed by examining boards.

All inspectors are trained in applicable laws and inspection procedures through a combination of classroom and on-the-job training. In general, people who want to become health and regulatory inspectors should be able to accept responsibility and like detailed work. They should be neat and personable and able to express themselves well orally and in writing.

Federal Government inspectors are promoted on a Civil Service "career ladder." Workers whose performance is satisfactory advance automatically, usually at 1-year intervals, to a specified maximum level. Above this level (usually supervisory positions), advancement is competitive, based on agency needs and individual merit.

## Job Outlook

Employment of health and regulatory inspectors as a group is expected to increase more slowly than the average for all occupations through the 1980's. Employment growth is expected to be constrained by slow growth in government regulatory programs and in government spending. Most job openings will be to replace those who transfer to other occupations, retire, or die.

Because health and regulatory inspectors are government workers, their employment is seldom affected by general economic fluctuations. Most inspectors work in programs which enjoy wide public support. As a result, they are less likely to lose their jobs than many other workers when government programs are cut.

## Earnings

In the Federal Government, aviation safety officers and mining inspectors usually started at $18,585 a year in early 1981. Other health and regulatory inspectors and graders started at $12,266 a year in early 1981.

Experienced food inspectors and agricultural commodity graders averaged about $18,500 a year in 1980. Experienced immigration and customs inspectors averaged more than $20,000 a year; agricultural quarantine and alcohol, tobacco, and firearms inspectors about $23,000 a year; and wage-hour compliance inspectors more than $26,000 a year in 1980. Experienced consumer safety inspectors, mine inspectors, and occupational safety and health inspectors employed by the Federal Government averaged more than $28,000 in 1980. Experienced aviation safety officers averaged over $36,000 a year.

Nonsupervisory environmental health inspectors working for selected U.S. cities and counties received average starting salaries of about $14,000 in 1980; those working for State governments started at about $1,500 less. Experienced environmental health inspectors working for State governments earned between $14,800 and $20,000 but top supervisors and administrators had salaries between $21,200 and $29,000 in 1980.

## Related Occupations

Health and regulatory inspectors are responsible for seeing that government laws and regulations are obeyed. Revenue agents, construction inspectors, State and local police officers, and fish and game wardens also enforce laws.

## Sources of Additional Information

Information on Federal Government jobs is available from local offices of the State employment service, area offices of the U.S. Office of Personnel Management, and Federal Job Information Centers in large cities throughout the country. For information on a career as a specific type of inspector, the Federal department or agency that employs them may also be contacted directly.

Information about State and local government jobs is available from State civil service commissions, usually located in each State capital, or from local government offices.

# Hotel Managers and Assistants

(D.O.T. 163.117-018; 187.117-038, .167-078, -110, -122, -126; 238.137-010)

## Nature of the Work

Hotel managers are responsible for operating their establishments profitably, and satisfying hotel guests. They determine room rates and credit policy, direct the operation of the food service operation, and manage the housekeeping, accounting, security, and maintenance departments of the hotel. Han-

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dling problems and coping with the unexpected are important parts of the job.

A small hotel or motel requires only a limited staff, and the manager may have to fulfill various front office duties, such as taking reservations and assigning rooms. When management is combined with ownership, these activities may expand to include all aspects of the business.

General managers of large hotels usually have several assistants or department heads who manage various parts of the operation. Because the hotel restaurant and cocktail lounge are important to the success of the entire establishment, they almost always are operated by managers with experience in the restaurant field. Other areas that usually are handled separately are advertising, rental of banquet and meeting facilities, marketing and sales, personnel, and accounting.

Large hotel and motel chains often centralize some activities, such as purchasing and advertising, so that individual hotels in the chain may not need managers for these departments. Managers who work for chains may be assigned to organize a newly built or purchased hotel or to reorganize an existing hotel or motel that is not operating successfully.

About 84,000 hotel and motel managers worked in 1980.

Management trainees learn the business by working in the various departments of a hotel.

## Working Conditions

Since hotels are open around the clock, night and weekend work is common. Hotel employees frequently must work on shifts. Managers who live in the hotel usually have regular work schedules, but they may be called for work at any time.

Hotel managers sometimes experience the pressures of coordinating a wide range of functions. Dealing with irate or non-English-speaking patrons can also be stressful. The job can be particularly hectic around check-out time.

## Training, Other Qualifications, and Advancement

Experience generally is the most important consideration in selecting managers. However, employers increasingly are emphasizing college education. A bachelor's degree in hotel and restaurant administration provides particularly strong preparation for a career in hotel management. In 1980, over 80 colleges and universities offered 4-year programs in this field. Because more aspiring hotel managers seek formal training, applicants to these programs may face increasing competition in the coming years, however. Many junior colleges, technical institutes, and the Educational Institute of the American Hotel and Motel Association also have courses in hotel work that provide a good background.

Included in many college programs in hotel management are courses in hotel administration, accounting, economics, data processing, housekeeping, food service management and catering, and hotel maintenance engineering. Part-time or summer work in hotels and restaurants is encouraged because the experience gained and the contacts with employers may benefit students when they seek a job after graduation.

Managers should have initiative, self-discipline, and the ability to organize and direct the work of others. They must be able to solve problems and concentrate on details.

Sometimes large hotels sponsor specialized, on-the-job management training programs which enable trainees to rotate among various departments and receive a thorough knowledge of the hotel's operation. Other hotels may help finance the necessary training in hotel management for outstanding employees.

Most hotels promote employees who have proven their ability, usually front office clerks, to assistant manager and eventually to general manager. Newly built hotels, particularly those without well-established on-the-job training programs, often prefer experienced personnel for managerial positions. Hotel and motel chains may offer better opportunities for advancement than independently owned establishments, because employees can transfer to another hotel or motel in the chain or to the central office if an opening occurs.

## Job Outlook

Employment of hotel managers is expected to grow faster than the average for all occupations through the 1980's as additional hotels and motels are built and chain and franchise operations spread. However, most openings will occur as experienced managers die, retire, or leave the occupation. Seasonal employment opportunities will be available in resort establishments that are open only part of the year.

Applicants who have college degrees in hotel administration will have an advantage in seeking entry positions and later advancement.

## Earnings

Salaries of hotel managers and assistants are particularly dependent upon the size and sales volume of the hotel, and vary greatly because of differences in duties and responsibilities. Hotel manager trainees who are graduates of specialized college programs generally start at around $13,500 a year and usually are given periodic increases for the first year or two. Experienced managers may earn several times as much as beginners. For example, salaries of hotel general managers ranged from about $20,000 to $80,000 a year in 1981, according to a survey conducted by the American Hotel and Motel Association. Hotel food and beverage managers earned from about $16,000 to $40,000. Managers may earn bonuses ranging from 10 to 20 percent of their basic salary in some hotels. In addition to salary, hotels sometimes furnish managers and their families with lodging in the hotel, meals, parking facilities, laundry, and other services.

Most employees receive 5 to 10 paid holidays a year, paid vacation, sick leave, life insurance, medical benefits, and pension plans. Some hotels offer bonuses, profit sharing plans, educational assistance, and other benefits to their employees.

## Related Occupations

Hotel managers and assistants are not the only workers concerned with organizing and directing a business where pleasing people is very important. Other workers with similar responsibilities include apartment building managers, food service managers, department store managers, office managers, and sales managers.

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## Sources of Additional Information

Information on careers and scholarships in the lodging industry may be obtained from:

The American Hotel and Motel Association, 888 7th Ave., New York, N.Y. 10019.

For a directory of colleges and other schools offering programs and courses in hospitality education, write to:

Council on Hotel, Restaurant, and Institutional Education, Human Development Building, Room 118, University Park, Pa. 16802.

# Medical Record Administrators

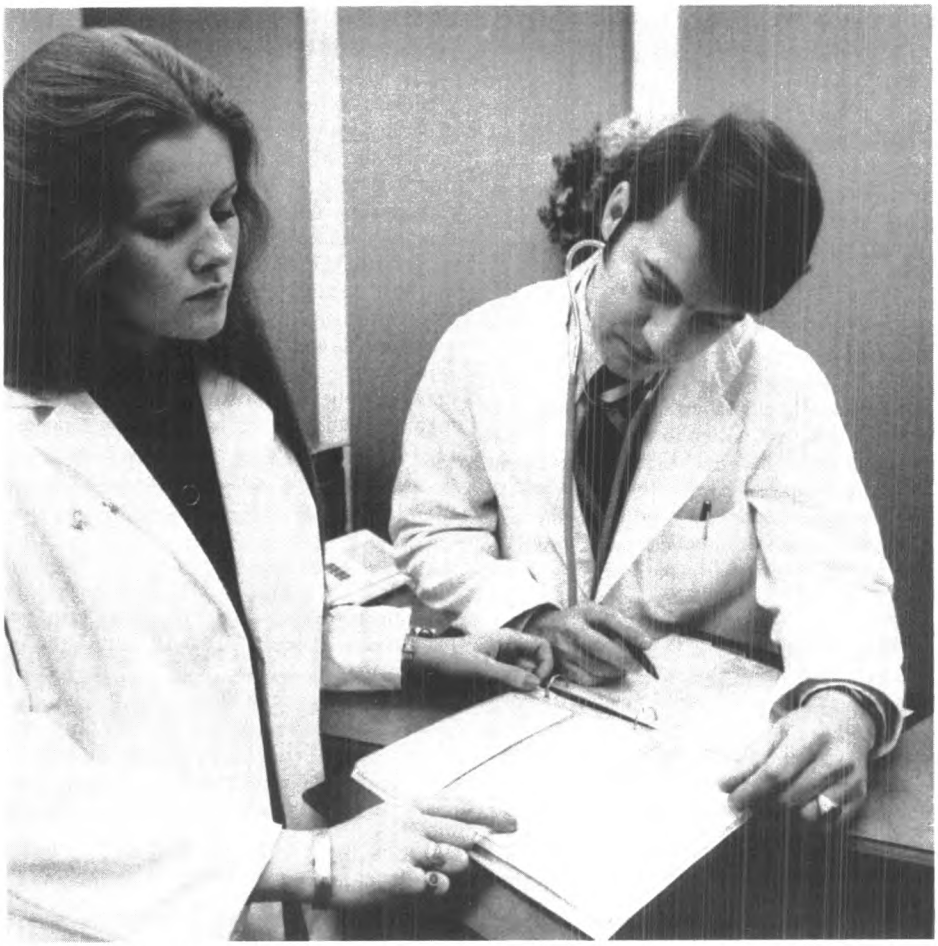
(D.O.T. 079.167-014)

## Nature of the Work

All health care institutions record medical information on each patient, including case histories of illnesses or injuries, reports on physical examinations, X-rays and laboratory tests, doctors' orders and notes, and nurses' notes. These records are necessary for correct and prompt diagnosis and treatment of illnesses and injuries. They also are used for research, insurance claims, legal actions, evaluation of treatment and medications prescribed, and in the training of medical personnel. Medical information also is used to evaluate patient care in hospitals and to plan health care in the community.

Medical record administrators direct the activities of the medical record department and develop systems for documenting, storing, and retrieving medical information. They supervise the medical record staff, which processes and analyzes records and reports on patients' illnesses and treatment. They train the medical record staff for specialized jobs, compile medical statistics for State or national health agencies, and assist the medical staff in evaluations of patient care or research studies. Medical record administrators serving as department heads are a part of the hospital management staff and participate fully in management activities. As the administrators responsible for the medical information system, they may be required to testify in court about records and record procedures.

The size and type of institution affect the duties and responsibility assigned to medical record administrators. Large hospitals have chief medical record administrators who supervise other medical record administrators, technicians, and clerks. Smaller hospitals may employ only two or three persons in the medical record department; nursing homes often have one person in charge of medical records. Small health care facilities may employ a part-time medical record administrator to advise technical and clerical personnel.



Most medical record administrators work in hospitals.

## Working Conditions

Medical record adminstrators generally work a standard 40-hour week in clean, well-lighted surroundings. Because the record department seldom is involved in emergencies, the pace of work usually is regular and not crisis-oriented. However, accuracy and attention to detail can be very tiring.

## Employment

An estimated 15,000 medical record administrators were employed in 1980. Most worked in hospitals. The remainder worked in nursing homes, clinics, group practices, public health departments, and university medical centers. Health insurance companies employ medical record administrators to help determine liability for payment of clients' medical fees. Some medical record administrators work for firms which manufacture equipment for recording and processing medical data and which develop and print health insurance and medical forms.

## Training, Other Qualifications, and Advancement

Preparation for a career in this field is available through college and university programs that lead to a bachelor's degree in medical record administration. Medical schools offer many of these programs. Since concentration in medical record administration begins in the third or fourth year of study, transfer from a community or junior college is possible. One-year certificate programs are open to those who already have a bachelor's degree and required courses in the liberal arts and biological sciences.

In 1980, 55 programs in medical record administration were approved by the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association in collaboration with the American Medical Record Association (AMRA). High school courses that provide a good background include health, business administration, mathematics, computer science, and biology.

Training for medical record administrators includes both classroom instruction and practical experience. Anatomy, physiology, fundamentals of medical science, medical terminology, and medical record science are among the required scientific courses. In addition, management courses such as hospital organization and administration, health law, statistics, data processing, and computer science are part of the curriculum. Experience in the medical record departments of hospitals provides students with a practical background in applying standardized medical record practices, compiling statistical reports, analyzing data, and organizing medical record systems.

Graduates of approved schools in medical record administration are eligible for the national registration examination given by AMRA. Passing this examination gives pro-

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fessional recognition as a Registered Record Administrator (RRA). According to the AMRA, there were about 6,500 employed RRA's in 1980.

Medical record administrators must be accurate and interested in detail, and must be able to speak and write clearly. Because medical records are confidential, medical record administrators must be discreet in processing and releasing information. Supervisors must be able to organize, analyze, and direct work procedures and to work effectively with other hospital personnel.

Medical record administrators with some experience in smaller health facilities may advance to positions as department heads in large hospitals or to higher level positions in hospital administration. Some coordinate the medical record departments of several small hospitals. Others move on to medical record positions in health agencies. Many teach in the expanding programs for medical record personnel in 2- and 4-year colleges and universities.

## Job Outlook

Employment opportunities for graduates of approved medical record administrator programs are expected to be good through the 1980's. Employment is expected to grow faster than the average for all occupations due to a growing and aging population; more information required by third-party payers, such as insurance companies and government agencies; and standardization of health records in outpatient clinics, community health centers, nursing homes, and home care programs. The widespread use of computers to store and retrieve medical information should stimulate demand for administrators qualified to develop automated record systems.

In addition to jobs created by heightened demand for these workers, openings will occur as medical record administrators transfer to other kinds of work, retire, or die.

Part-time employment opportunities should continue in teaching, research, and consulting work for health care facilities.

## Earnings

The salaries of medical record administrators are influenced by the location, size, and type of the employing institution, as well as by the duties and responsibilities of the position. The average starting salary for medical record administrators in hospitals was about $18,000 a year in 1981, according to a national survey conducted by the University of Texas Medical Branch. Experienced record administrators in hospitals averaged about $23,600 a year, with some earning well over $30,000.

Newly graduated medical record administrators employed by the Federal Government generally started at about $12,300 a year in early 1981; those having good academic records were eligible to begin at about $15,200. In 1980, experienced medical record administrators averaged about $19,500 a year in the Federal Government.

## Related Occupations

Medical record administrators work almost exclusively in hospitals and, as members of the health care team, assume responsibility for a large volume of medical records. They train and supervise workers who verify, transcribe, code, and maintain files on patients' medical history. Other occupations which provide similar services in related fields include emergency medical service coordinators, hospital-insurance representatives, library directors, and public health educators.

## Sources of Additional Information

Information about approved schools and employment opportunites is available from:

American Medical Record Association, John Hancock Center, Suite 1850, 875 N. Michigan Ave., Chicago, Ill. 60611.

# Occupational Safety and Health Workers

(D.O.T. 010.061-026; 012.061-014, .167-022, -026, -034, and -058, and .261-010; 079.021-010 and .161-010; 168.167-078, .264-014, and .267-074; 373.167-018 .367-010; and 821.367-014; and 909.127-010)

## Nature of the Work

Occupational safety and health workers strive to control occupational accidents and diseases, property losses from accidents and fires, and injuries from unsafe products. This group of workers includes safety engineers, fire protection engineers, industrial hygienists, and loss control and occupational health consultants. Workers employed in safety and health occupations peculiar to government are discussed in the statement on health and regulatory inspectors elsewhere in the *Handbook*.

The largest group of safety workers is *safety engineers* (D.O.T. 012.061-014). Although all are concerned with preventing accidents, their specific tasks depend on where they work. For example, safety engineers in large manufacturing plants may develop a comprehensive safety program covering several thousand employees. They analyze each job in the plant to identify potential hazards that can be avoided with preventive measures. When accidents occur, safety engineers investigate to determine the cause. If poor design, improper maintenance, or mechanical failure is involved, they use their technical skills to correct the situation and prevent its recurrence. When human error causes an accident, safety engineers may drill workers in proper safety procedures.

Safety engineers who work for trucking companies (D.O.T. 909.127-010) study schedules, routes, loads, and speeds to determine their influence on trucking accidents.

Safety engineer taking measurements.

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They also inspect trucks and trailers and suggest ways of safer operation. In the mining industry, safety engineers (D.O.T. 010.061-026) may inspect underground or open-pit areas to insure compliance with State and Federal laws, design protective equipment and safety devices for mine workers and machinery, or lead rescue activities during emergencies.

Many safety engineers are concerned with the safety of their company's products. They work with design engineers to develop models that meet safety standards, and they monitor the manufacturing process to insure the safety of the finished product.

*Fire protection engineers* (D.O.T. 012.167-026) safeguard life and property against fire, explosion, and related hazards. Those in research investigate problems such as fires in high-rise buildings or the manufacture, handling, and storage of flammable materials. Fire protection engineers in the field use these research findings to identify and correct hazards. For example, findings concerning flashpoints (the temperatures at which different materials will ignite) are valuable to the engineer designing storage facilities in a chemical plant.

Like safety engineers, fire protection engineers may have different job duties depending on the place where they work. Those with fire equipment manufacturing companies may design new fire protection devices, while those in design and consulting firms work with architects and other engineers to insure that fire safety is built into new structures. Fire protection engineers working for insurance rating bureaus (organizations that calculate costs of insurance coverage in particular areas) inspect commercial and industrial properties to evaluate the adequacy of fire protection. Many fire protection engineers specialize in one or more types of fire protection, such as sprinkler or fire detection systems.

While safety and fire protection engineers primarily strive to minimize the dangers of accidents from careless operation of machinery and other physical hazards, *industrial hygienists* (D.O.T. 079.161-010) seek to minimize environmental health hazards in the workplace. These health professionals are concerned with how noise, dust, vapors, chemicals, and other hazards common to the industrial setting affect workers' health. Many take air samples, monitor noise levels, or measure radioactivity levels at job sites. Other industrial hygienists work in private laboratories maintained by large insurance companies or industrial or consulting firms. Laboratory hygienists analyze air samples, do research on the reliability of health equipment such as respirators, or investigate the effects of exposure to chemicals or radiation. Some hygienists specialize in problems of air and water pollution. They work with government officials, environmental groups, labor organizations, and plant management to develop systems to screen harmful substances before they enter and pollute air and waterways.

*Loss control* and *occupational health consultants* (D.O.T. 168.167-078) in property-liability insurance companies perform many services for clients. These range from correcting a single hazard in a small business to devising a program to eliminate or reduce all hazards in a large firm. When dealing with a new account, the consultant thoroughly inspects the plant and then confers with management to formulate a program that meets the company's needs. The consultant may, for example, help set up plant health programs and medical services, assist plant personnel to insure that a new facility meets all safety requirements, or train plant safety people. Safety and health consultants also help their company's underwriters determine whether a risk is acceptable and the amount of premium to charge.

## Working Conditions

Although occupational safety and health workers are based in offices, much of their time is spent at work sites inspecting or studying safety hazards, talking to workers, or taking air or dust samples. Safety and health workers may travel a great deal unless they work exclusively at a single plant. The amount of travel depends upon job specialty and geographic location. For example, the plant safety engineer may travel only to an occasional seminar or conference, while the insurance consultant may spend about half the time away from the home office, inspecting worksites.

## Employment

An estimated 80,000 occupational safety and health workers were employed in 1980. About half were safety engineers, and most of the rest were fire protection engineers, industrial hygienists, or workers who divided their time between two or more areas. A few were engineering or industrial hygiene technicians

Occupational safety and health workers were employed throughout the economy, but were concentrated in manufacturing, insurance, and engineering and architectural services industries.

Occupational safety and health workers are generally employed in population and industrial centers. Insurance consultants generally have offices in a major city and travel to and from various sites.

## Training, Other Qualifications, and Advancement

The basic entry requirement for occupational safety and health jobs is a bachelor's degree in engineering or one of the physical or biological sciences. Employers usually prefer a bachelor's or master's degree specifically related to occupational safety and health, such as safety engineering or management, industrial hygiene, fire protection engineering, public health, or health physics, or a degree in chemical or mechanical engineering. Some employers hire graduates of 2-year college curriculums as technicians, particularly if they have work related experience.

To stay abreast of changing technologies, new ideas, and emerging trends, many insurance companies offer training seminars and correspondence courses for their staffs. The Occupational Safety and Health Administration (OSHA) conducts courses for safety and health workers on topics such as occupational injury investigation and radiological health hazards. The recognized marks of achievement in the field are the designations Certified Safety Professional; Certified Industrial Hygienist; and Member, Society of Fire Protection Engineers. The Board of Certified Safety Professionals and the American Board of Industrial Hygiene certify candidates who complete the required experience and pass an examination. A few States require that occupational safety and health professionals be licensed.

In addition to possessing technical competence, safety and health workers must communicate well and motivate others. They should be able to adapt to different situations, and be equally at ease with a representative of a local union, a supervisor in the welding shop, or a corporate executive. Because physical activity is basic to the job, good physical condition is necessary.

In the insurance industry, safety and health workers can be promoted to department manager in a small branch office, then to a larger branch office, and finally to an executive position in the home office. In industrial firms, they can advance to safety and health manager for one or several plants. Technicians with appropriate experience and education can advance to professional safety and health positions.

## Job Outlook

Reflecting a growing economy, a larger labor force, and continued concern for worker and consumer safety, employment of safety and health workers is expected to increase about as fast as the average for all occupations through the 1980's. Many openings also will arise from the need to replace workers who transfer to other occupations, retire, or die.

Many firms are expected to establish a safety and health program, and others will upgrade and expand existing programs in response to government requirements, union interest, and rising insurance costs. The number of safety and health workers in casualty insurance companies also will increase as more small employers request the services of their insurer's engineering or loss control department. Prospects should be best for graduates of occupational safety or health related curriculums.

## Earnings

Experienced occupational safety and health workers averaged about $28,000 a year in 1980. Depending on their qualification, safety and health workers with bachelor's degrees generally started at salaries between $20,000

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and $22,000 a year in late 1980. Those with a graduate degree usually received higher starting salaries, and technicians somewhat lower ones. Many safety and health workers with supervisory responsibilities earned more than $30,000 a year.

### Related Occupations

Occupational safety and health workers insure that industrial production is carried out in a manner that is safe for workers. Related occupations also concerned with the technology of production include mechanical, chemical, product safety, industrial, and pollution-control engineers.

### Sources of Additional Information

For general information about safety careers, and colleges and universities offering degree programs in the occupational safety and health field, write to:

American Society of Safety Engineers, 850 Busse Hwy., Park Ridge, Ill. 60068.

Information concerning a career in industrial hygiene is available from:

American Industrial Hygiene Association, 475 Wolf Ledges Pkwy., Akron, Ohio 44311.

Career information concerning fire protection engineering may be obtained from:

Society of Fire Protection Engineers, 60 Batterymarch St., Boston, Mass. 02110.

Career information on insurance loss control consulting is available from the home offices of many property-liability insurance companies.

For information on requirements for various careers in the occupational safety and health field, as well as lists of college and universities that award degrees in the various occupational safety and health disciplines, contact:

Division of Training and Manpower Development, National Institute for Occupational Safety and Health, Robert A. Taft Laboratories, 4676 Columbia Pkwy., Cincinnati, Ohio 45226.

# Personnel and Labor Relations Specialists

(D.O.T. 079.127-010; 166.067-010, .117, .167-014, -018, -022, -026, -030, -034, .227-010, .267-018, -030; and 169.207-010)

### Nature of the Work

Attracting the best employees available and matching them to the jobs they can do best is important for the success of any organization. But many enterprises have become too large to permit close contact between management and employees. Instead, personnel and labor relations specialists provide this link—assisting management to make effective use of employees' skills, and helping employees to find satisfaction in their jobs and working conditions. Although some jobs in this field require only limited contact with people outside the office, most involve frequent contact. Dealing with people is an essential part of the job.

Personnel specialists and labor relations specialists concentrate on different aspects of employer-employee relations. Personnel specialists interview, select, and recommend applicants to fill job openings. They keep informed of rules and regulations pertaining to affirmative action and equal employment opportunity and oversee the implementation of policies governing hiring and advancement. They handle wage and salary administration, training and career development, and employee benefits. "Labor relations" mean union-management relations, and people who specialize in this field work in unionized establishments, for the most part. They help company officials prepare for collective bargaining sessions, participate in contract negotiations, and handle labor relations matters that come up every day.

In a small organization, personnel work consists mostly of interviewing and hiring, and one person can handle it all. By contrast, the professional staff of a large personnel department may include recruiters, interviewers, job analysts, benefits specialists, training specialists, and labor relations specialists. Personnel clerks and assistants handle routine tasks such as issuing forms, maintaining files, compiling statistics, and answering inquiries.

Personnel work often begins with the *recruiter*, who maintains contacts within the community and may travel extensively—usually to college campuses—in the search for promising job applicants. Recruiters talk to applicants, and refer and recommend those who appear qualified to fill vacancies. They may administer pre-employment tests and check references. These workers need to be thoroughly familiar with the organization and its personnel policies, for they must be prepared to discuss wages, working conditions, and promotional opportunities with prospective and newly hired employees. They also need to keep informed about equal employment opportunity (EEO) and affirmative action guidelines.

*EEO representatives* or *affirmative action coordinators* handle this complex and sensitive area in large organizations. They maintain contact with women and minority employees, and investigate and resolve EEO grievances. They also examine corporate practices for possible violations, and compile and submit EEO statistical reports.

*Job analysts* (D.O.T. 166.267-018), sometimes called *compensation analysts*, do very exacting work. They collect and examine detailed information about job duties in order to prepare job descriptions. These descriptions or "position classifications" explain the duties, training, and skills each job requires. Whenever a large organization introduces a new job or reviews existing ones, it calls upon the expert knowledge of the job analyst. Accurate information about job duties also is required when an organization considers changes in its pay system.

Establishing and maintaining a firm's pay system is the principal job of the *compensation manager* (D.O.T. 166.167-022). With the assistance of staff specialists, compensation managers devise ways to ensure that pay rates within the firm are fair and equitable. They may conduct surveys from time to time to see how their pay rates compare with others. Being certain that the firm's pay system complies with laws and regulations is another part of the job, one that requires knowledge of compensation structures and labor law.

Human resource development is emerging

Personnel specialist interviews applicant for job opening.

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as a major specialization within personnel administration. *Training specialists* (D.O.T. 079.127-010; 166.167-026, .227-010) are responsible for a broad range of employee education and training activities. They work with adults in a variety of business and industrial settings, as well as in local, State, and Federal government agenices. Trainers conduct orientation sessions for new employees and arrange on-the-job training for them. They develop in-house programs as needs are identified; they may, for example, instruct experienced workers in the impact of new procedures or the operation of new equipment, or they may teach management skills to new supervisors. In addition to designing, developing, and conducting programs, these specialists assess employee training needs; maintain records of company training activities; and monitor and evaluate the effectiveness of various kinds of training. Helping employees prepare for future responsibilities is an increasingly important part of the job. Sometimes, this means setting up an individualized training plan, which provides a timetable for strengthening existing job-related skills and acquiring new ones. Career development may involve employer-financed study outside the company as well as job rotation to different parts of the firm. The training function within a company and the role and responsibilities of training specialists vary greatly, depending on the size of the firm and organizational goals and objectives.

*Employee-welfare managers* (D.O.T. 166.117-014, 166.167-018) handle the employer's benefits program, notably its insurance and pension plans. Expertise in designing and administering benefits programs is increasingly important in the personnel field, in part because of the enactment of the Employee Retirement Income Security Act (ERISA). ERISA reporting requirements are an important responsibility for personnel departments in large firms.

The scope of employee benefits has grown considerably, and many firms offer their employees such benefits as dental insurance, accidental death and disability insurance, auto insurance, home owners' insurance, stock options, profit sharing and thrift/savings plans in addition to conventional health insurance and pension coverage. Benefits analysts and benefits administrators handle these programs. They also are responsible for developing and coordinating services as diverse as van-pooling, child care, lunchrooms and company cafeterias, newsletters, annual physical exams, recreation and physical fitness, and counseling. Personal and financial counseling for employees approaching retirement age is becoming a more important part of the job.

Occupational safety and health programs are handled in various ways. In small companies especially, accident prevention and industrial safety are the responsibility of the personnel department–or of the labor relations specialist, if the union has a safety representative. Increasingly, however, there is a separate safety department under the direction of a safety and health professional, generally a safety engineer or industrial hygienist. (The work of occupational safety and health workers is discussed elsewhere in the *Handbook*.)

*Labor relations specialists* (D.O.T. 166.167-034) advise management on all aspects of union-management relations. When a collective bargaining agreement is up for negotiation, they provide background information for management's negotiating position, a job that requires familiarity with sources of economic and wage data as well as extensive knowledge of labor law and collective bargaining trends. Actual negotiation of the agreement is conducted at the top level, with the director of labor relations or another top-ranking official serving as the employer's representative, but members of the company's labor relations staff play an important role throughout the negotiations.

Much of the work of the labor relations staff concerns interpretation and administration of the contract, the grievance procedures in particular. Labor relations specialists might work with the union on seniority rights under the layoff procedure set forth in the contract, for example, or meet with the union steward about a grievance. Doing the job well means staying abreast of current developments in labor law, including arbitration decisions, and maintaining continuing liaison with union officials.

Personnel specialists in government agencies generally do the same kind of work as those in large business firms. There are some differences, however. Public personnel specialists deal with employees whose jobs are subject to civil service regulations. Because civil service jobs are strictly classified as to entry requirements, duties, and pay, much of the emphasis in public personnel work is on job analysis. Training and career development are growing in importance in the public sector, however, so much so that an entire "industry" of educational and training consultants helps provide staff training for public agencies. Labor relations in the public personnel field have changed as union strength among government workers has grown. This has created a need for more and better trained workers to handle negotiations, grievances, and arbitration cases on behalf of Federal, State, and local government agencies.

## Working Conditions

Since personnel offices generally are located where outside visitors and prospective employees gain an initial impression of the organization, they tend to be modern and pleasant places to work. Personnel specialists usually work a standard 35-to 40- hour workweek. Labor relations specialists, however, may work longer hours–particularly when contract agreements are being prepared and negotiated.

Although most personnel specialists spend their time in the office, some of them travel extensively. Recruiters regularly attend professional meetings and visit college campuses to interview prospective employees.

## Employment

In 1980, about 178,000 people worked as personnel and labor relations specialists. Two out of three worked in private industry, where they were employed by businesses of every description. Personnel and labor relations specialists work for firms that engage in manufacturing; construction; trade; transportation and communications; finance, insurance, and real estate; and services. Some work for labor unions. Others are employed by, or run, management consulting firms that specialize in such areas as compensation, pension planning, and staff development.

Approximately 55,000 personnel and labor relations specialists worked for Federal, State, and local governments in 1980. They handled recruitment, interviewing, job classification, training, and related matters for the Nation's 15 million public employees: police officers, fire-fighters, sanitation workers, teachers, hospital workers, and many others.

Labor unions employed about 12,000 of these workers in 1980. An elected union official generally handles labor relations matters at the company level. At national and international union headquarters, however, the research and education staff usually includes specialists with professional training in industrial and labor relations, economics, or law.

Some personnel and labor relations specialists teach college or university courses in personnel administration, industrial relations, and related subjects.

## Training, Other Qualifications, and Advancement

A college degree is required for most beginning positions in this field. Prospective personnel or labor relations specialists have a wide choice of undergraduate majors, for a number of disciplines provide a suitable background. Some employers look for individuals who have majored in personnel administration or industrial and labor relations, while others prefer college graduates with a general business background. Still other employers feel that a well-rounded liberal arts education is best; many personnel specialists have degrees in psychology, sociology, counseling, or education. A master's in business administration (M.B.A.) also provides suitable preparation for a job in the field. Individuals looking for a job with a government agency may find that a degree in personnel administration, political science, or public administration is an asset.

At least 200 colleges and universities have programs leading to a degree in the field of personnel and labor relations. Other colleges and universities offer programs in personnel administration or personnel management. About 70 colleges and universities offer degree or certificate programs in training and development. Depending on the school, preparation for a career in human resources

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development may be obtained in departments of business administration, education, instructional technology, organizational development, human services, communication, or public administration.

Because an interdisciplinary background is appropriate for work in this area, a combination of courses in the social sciences, behavioral sciences, business, and economics is useful. Prospective personnel specialists might take courses in principles of management, organization dynamics, and human relations. Other relevant courses include business administration, public administration, psychology, sociology, political science, economics, and statistics. Courses in labor law, collective bargaining, labor economics, labor history, and industrial psychology provide a valuable background for the prospective labor relations specialist.

Graduate study in industrial or labor relations may be required for work in labor relations. A law degree seldom is required for entry level jobs, but most of the people responsible for contract negotiations are lawyers, and a combination of industrial relations courses and a law degree is highly desirable. Although a growing number of people enter the labor relations field directly, some begin in personnel work, gain experience in that area, and subsequently move into a labor relations job.

Getting a college education, though highly important, is not the only way to enter personnel work. Some clerks advance to professional positions through experience. However, even then, part-time college courses are useful.

Newly hired workers usually enter formal or on-the-job training programs where they learn how to classify jobs, interview applicants, or administer employee benefits. Next, they are assigned to specific areas in the personnel department, to gain experience. Later, they may advance within their own company or transfer to another employer. Advancement eventually may take the form of responsibility for managing a major element of the personnel program—compensation, training, or EEO/affirmative action, for example.

Workers in the middle ranks of a large organization, including the personnel department, often advance by moving into a top job in a smaller organization. Employees with exceptional ability may be promoted to executive positions, such as director of personnel or director of labor relations.

Personnel and labor relations specialists should speak and write effectively and be able to work with people of all levels of education and experience. They also must be able to see both the employee's and the employer's points of view. In addition, they should be able to work as part of a team. They need supervisory abilities and must be able to accept responsibility. Integrity, fairmindedness, and a persuasive, congenial personality are all important qualities.

## Job Outlook

The number of personnel and labor relations specialists is expected to grow about as fast as the average for all occupations through the 1980's. Most of this growth will occur in the private sector as employers, aware of the potential benefits, try to provide effective employee relations programs for an expanding work force. Within public personnel administration, opportunities probably will be best in State and local governments. At the Federal level, most job openings will result from replacement needs. In addition to new jobs created by heightened demand for these workers, many openings will occur every year as personnel and labor relations specialists change occupations, retire, or die.

Legislation setting standards for employment practices in the areas of occupational safety and health, equal employment opportunity, and pensions has greatly increased record keeping and reporting requirements as well as legal requirements, thus stimulating demand for personnel and labor relations workers. Continued growth is foreseen as employers review and evaluate programs in these areas.

Every year, billions of dollars are spent on employee training in the public and private sectors, and the amount is expected to increase in the decade ahead. Greater emphasis on productivity is expected to stimulate greater investment in job-specific, employer-sponsored training that aims to improve performance by sharpening employees' skills and heightening their motivation. Continued expansion in the area of human resource development will contribute to the projected increase in the number of personnel and labor relations specialists during the 1980's.

Although the number of jobs in this field is projected to increase over the next decade, job competition is increasing, too. Particularly keen competition is anticipated for jobs in labor relations. A small field, labor relations traditionally has been difficult to break into, and opportunities are best for applicants with a master's degree or a strong undergraduate major in industrial relations, economics, or business. A law degree is an asset.

## Earnings

Typical entry level jobs in the personnel field include job analyst, EEO representative, benefits analyst, and training specialist. These positions generally require a bachelor's degree but no experience. Salaries vary widely, and depend on the size and location of the firm as well as the nature of its business.

In 1980, according to a survey conducted by the American Management Associations (AMA), starting salaries for job analysts–sometimes called position analysts, wage analysts, or compensation analysts–ranged from $14,800 to $21,900 with an average of $16,100. EEO representatives had average starting salaries of $17,100; benefits analysts, $18,000; and training specialists, $19,000. Salaries rise with experience and more demanding work assignments, and job analysts with more than 5 years experience had salaries in the $21,000-$31,600 range in 1980, with an average of $25,000. EEO representatives, benefits analysts, and training specialists with over 5 years experience also had salaries of $25,000-$27,000, on the average.

Average annual salaries of personnel directors in private industry ranged from $27,719 to $49,730 in 1980, according to a Bureau of Labor Statistics survey. Top personnel and labor relations executives in large corporations earned considerably more.

Average salaries for personnel specialists employed by State governments ranged from $12,700 to $17,200 a year in 1980, according to a survey conducted by the U.S. Office of Personnel Management. Personnel specialists who had supervisory responsibilities averaged from $18,900 to $25,900 and State directors of personnel earned average salaries ranging from $36,500 to $42,000.

In the Federal Government, new graduates with a bachelor's degree generally started at about $12,300 a year in late 1980. Those with a master's degree started at about $18,600. Average Federal salaries in several different areas of personnel and labor relations work were as follows in 1980:

| | |
|---|---|
| Mediator | $39,763 |
| Labor relations specialist | 29,371 |
| Labor-management relations examiner | 28,810 |
| Personnel management specialist | 27,374 |
| Employee development specialist | 26,884 |
| Position classifier | 26,190 |
| Salary and wage administrator | 26,060 |
| Employee relations specialist | 25,290 |
| Personnel staffing specialist | 24,315 |

## Related Occupations

All of the personnel and labor relations occupations are closely related. Other workers who help people find satisfactory jobs or help to make the work environment safe and pleasant include health and regulatory inspectors, occupational safety and health workers, lawyers, employment counselors, rehabilitation counselors, college career planning and placement counselors, industrial engineers, psychologists, and sociologists. All of these occupations are described elsewhere in the *Handbook*.

## Sources of Additional Information

For general information on careers in personnel and industrial relations, write to:

American Society for Personnel Administration, 30 Park Dr., Berea, Ohio 44017.

For information about the field of employee training and human resource development, contact:

American Society for Training and Development, 600 Maryland Ave. SW., Suite 305, Washington, D.C. 20024.

A brochure describing a career in labor-management relations as a field examiner is available from:

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Director of Personnel, National Labor Relations Board, 1717 Pennsylvania Ave. NW., Washington, D.C. 20570.

# Purchasing Agents

(D.O.T. 162.117-022 and -026; 162.157-010, -034 and -038; 162.167-010, -014 and -030)

## Nature of the Work

If an organization does not have the right materials, supplies, or equipment when they are needed, its entire production process or work flow could be interrupted or halted. Purchasing agents see to it that this does not happen. Purchasing agents, also called industrial buyers, obtain goods and services of the quality required at the lowest possible cost, and see that adequate materials and supplies always are available. Agents in industry and the government, depending on the nature of the operation, may buy machinery, raw materials, parts and components, furniture, business machines, vehicles, office supplies, and services. Information on retail buyers, who purchase merchandise for resale in its original form, rather than for internal use, is presented in the chapter on buyers elsewhere in the *Handbook*.

Purchasing agents buy supplies when the stock on hand reaches a predetermined reorder point, when a department in the organization requisitions items it needs, or when market conditions are especially favorable. Because agents often can purchase from many sources, their main job is selecting the supplier who offers the best value.

Purchasing agents use a variety of means to choose suppliers. They compare listings in catalogs, directories, and trade journals. They meet with salespersons to discuss items to be purchased and examine samples, and attend demonstrations of equipment. Frequently, agents invite suppliers to bid on large orders, and then select the lowest bidder among those who meet requirements for quality and delivery date.

Sometimes purchasing agents negotiate for custom-made products. To meet specifications, agents must thoroughly understand the products and their uses. In some cases, such as computer equipment, this means agents must have considerable technical knowledge. After placing an order, the purchasing agent checks periodically to insure prompt delivery.

Purchasing agents develop a good business relationship with suppliers in order to get cost savings, favorable payment terms, and quick delivery on emergency orders or help in obtaining scarce materials. Agents also work closely with other employees in their own organization. For example, they may discuss design of custom-made products with company engineers, defects in purchased goods with quality control technicians, or shipment problems with workers in the shipping department.

Purchasing agents' functions may differ according to the type and size of the organization. In a large firm, agents usually specialize in a commodity or group of commodities—for example, steel, lumber, cotton, or petroleum products. In smaller organizations, agents generally buy a wider range of goods, such as all raw materials or all office supplies, furniture, and business machines. Purchasing managers usually supervise a group of purchasing agents handling a number of related commodities.

Purchasing agent discusses a new product with the supplier.

## Working Conditions

Purchasing agents generally work a standard 35- to 40-hour week. Some overtime may be necessary if, for example, the supply of critical materials runs short. Although they spend most of their time in the office, some travel to suppliers, seminars, or trade shows.

## Employment

About 172,000 persons worked as purchasing agents in 1980. Over half worked in manufacturing industries. Large numbers also were employed by government agencies, construction companies, hospitals, and schools.

About half of all purchasing agents work in organizations that have fewer than five employees in the purchasing department. Many large business firms and government agencies, however, have much larger purchasing departments; some employ as many as 100 specialized purchasing agents.

## Training, Other Qualifications, and Advancement

Although there are no universal educational requirements for entry level jobs, most large organizations require a college degree, and prefer applicants with a master's degree in business administration or management. Companies that manufacture machinery or chemicals may prefer applicants with backgrounds in engineering or science, while other companies hire business administration majors as trainees. Courses in purchasing, accounting, economics, and statistics are helpful. Familiarity with computers also is desirable. A few colleges offer a college degree in purchasing.

Some small companies require a bachelor's degree; many others, however, hire graduates of associate degree programs in purchasing for entry level jobs. They also may promote clerical workers or technicians to purchasing jobs. Regardless of the size of an organization, however, a college degree is becoming increasingly important for advancement to management positions.

Whatever their educational background, beginning purchasing agents spend considerable time learning about company operations and purchasing procedures. They work with experienced buyers to learn about commod-

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ities, prices, suppliers, and negotiating techniques. They may be assigned to production planning to learn about the purchasing system, inventory records, and storage facilities.

Junior agents purchase standard and catalog items. As they gain knowledge and experience, they may be promoted to purchasing agent, then senior purchasing agent. Senior agents purchase highly complex, usually custom-made items.

Purchasing agents must be able to analyze the technical data in suppliers' proposals to make buying decisions and spend large amounts of money responsibly. The job requires the ability to work independently and a good memory for details. In addition, a purchasing agent must be able to get along well with people, to balance the needs of personnel in his or her organization with budgetary constraints, and to negotiate with suppliers. He or she may have to work with lawyers, contract administrators, and engineers and scientists when involved in complex procurements.

A qualified purchasing agent can become an assistant purchasing manager in charge of a group of purchasing agents and then advance to purchasing manager, director or vice president of purchasing, or director or vice president of materials management.

Continuing education is essential for advancement. Most agents participate in seminars offered by professional societies and take college courses in purchasing. In private industry, the recognized mark of experience and professional competence is the designation Certified Purchasing Manager (CPM). It is conferred by the National Association of Purchasing Management, Inc., upon candidates who pass four examinations and meet educational and experience requirements. In government, the indications of professional competence are the designations Professional Public Buyer (PPB) and Certified Public Purchasing Officer (CPPO), conferred by the National Institute of Governmental Purchasing, Inc. The PPB is earned by passing a written two-part examination and meeting educational and experience requirements. A candidate must meet more stringent basic requirements, pass a three-part written exam, and an oral assessment interview to earn the CPPO.

## Job Outlook

Employment of purchasing agents is expected to increase about as fast as the average for all occupations through the 1980's. Many job openings will occur as employed purchasing agents transfer to other work, retire, or die.

Demand for purchasing agents is expected to rise as the volume of goods and services produced increases and as their importance in reducing costs is increasingly recognized. Large industrial organizations will expand purchasing departments to handle the growing complexity of manufacturing processes. Many opportunities also should arise as service organizations such as hospitals and schools also recognize the importance of professional purchasers in reducing costs.

Persons who have a master's degree in business administration, a bachelor's degree in engineering, science, or business administration, and whose college program included some courses in purchasing should have the best opportunities. Graduates of 2-year programs in purchasing should continue to find good opportunities, especially in small firms.

## Earnings

College graduates hired as junior purchasing agents earned about $16,200 a year in 1981, according to a surveys conducted by the Bureau of Labor Statistics. Experienced agents purchasing standard items averaged about $20,300 a year; senior purchasing agents specializing in complex or technical goods averaged about $25,200. Assistant purchasing managers received average salaries of about $30,600 a year. Many corporate directors of purchasing or materials management earned well over $50,000 a year. Salaries generally are higher in large firms where responsibilities often are greater.

In the Federal Government, beginning purchasing agents who had college degrees earned $12,266 or $15,193 in early 1981, depending on scholastic achievement and experience. Salary levels vary widely among State governments; average earnings range from $13,500 to $18,250 for purchasers of standard items, from $18,500 to $25,000 for senior buyers purchasing complex items, and from $27,700 to $36,200 for State purchasing directors.

## Related Occupations

Other workers who negotiate and contract to purchase equipment, supplies, or other merchandise include retail buyers, procurement services managers, livestock commission agents, traffic managers, and wholesalers.

## Sources of Additional Information

Further information about a career in purchasing is available from:

National Association of Purchasing Management, Inc., 11 Park Place, New York, N.Y. 10007.

National Institute of Governmental Purchasing, Inc., 1735 Jefferson Davis Hwy., Suite 101, Arlington, Va. 22202.

# School Administrators

(D.O.T. 091.107-010; 099.117-018, -022)

## Nature of the Work

"Go to the principal's office!" Do any five words strike more terror into the heart of a student? Principals—who are doubtless warm, outgoing souls when they are not disciplining students—are the most familiar and the most numerous school administrators. Other administrators are school district superintendents, assistant superintendents, and assistant principals. The jobs vary greatly, and most of what follows primarily concerns those in the public school system. But no matter the system, administrators provide the leadership and managerial ability that keep individual schools and entire school systems running smoothly.

The task of school administrators has grown more complex in recent years. Not only are schools and school systems larger than ever before—the result of a continuing trend toward consolidation—but they touch the lives of people who have become increasingly vocal, even angry, in pursuing their goals. It takes political as well as administrative skill to handle the issues that confront school leaders today: Desegregation, declining enrollment and school closings, contract negotiations with teachers, spiraling costs, and taxpayer resistance to higher taxes, to name a few. But, as educators, administrators have the satisfaction of knowing that their work smooths the way to knowledge for their schools' students.

The job of a school administrator begins with planning and setting goals. To achieve these goals, administrators must organize, coordinate, direct, and evaluate the activities of school personnel, ensuring that they meet deadlines and stick to their budgets. Administrators, acting on behalf of the school board, negotiate contracts and settle labor disputes. They must also maintain good relations with the public.

Superintendents, the chief administrators of a school district, oversee and coordinate the activities of all the schools in the district. The board of education selects the superintendent, whose duties range from routine administrative tasks to long-range planning. Naturally, the nature of the job depends in part on the size of the district. Managing the schools in Raynham, Massachusetts, is not quite the same as running all the public schools in Chicago. Nevertheless, the kind of work performed by the superintendent is essentially the same in every district.

On any given day, a superintendent may supervise the preparation of a budget; participate in collective bargaining sessions with employees; meet with parents, teachers, or local citizen's groups; plan for changes in physical facilities or staff size due to changes in enrollment; write reports to the school board; or issue directives pertaining to the operation of the school system.

Most superintendents have one or more deputies or assistants. An assistant superintendent's duties depend on the size and organization of the school system. In some districts, assistant superintendents oversee all the operations in a particular geographic area; in others, they have authority over specific activities—personnel, budget, or instruction and pupil services, for example.

Principals are the highest authority in a school. They are responsible for running the

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Elementary school principals try to become acquainted with every child.

school according to the standards set forth by the superintendent and board of education. The actual extent of a principal's authority varies a great deal from district to district.

Improving the quality of instruction is the principal's most important responsibility. Most principals visit classrooms, review instructional objectives, and examine learning materials. But principals also spend a great deal of time doing paperwork: Filling out forms, preparing administrative reports, keeping track of attendance, seeing that supplies are properly requisitioned and allocated, and so on. Despite the paperwork, principals spend much of the day with people. They confer with teachers and other staff—advising, explaining, or answering procedural questions; they talk with parents and members of the community; and they meet with students—particularly those who cause disciplinary problems.

In larger schools, assistant principals often handle the discipline. Assistant principals may also provide individual or group counseling about personal, social, educational, or vocational matters. And they often coordinate school social and recreational programs.

## Working Conditions

School administrators work mainly in offices, but they spend some time away from their desks at meetings with parent and teacher associations, the school board, and civic groups. Principals and assistant principals also sit in on classes, attend school assemblies and sports events, and check the school's physical facilties.

School superintendents and principals usually work a standard 40-hour week. However, at night and on weekends, they often go to meetings or attend to problems that require immediate attention. Unlike teachers, administrators work at pretty much the same tasks year round and can usually be found at their desks even during school vacations.

## Employment

An estimated 150,000 elementary and secondary school administrators were employed in 1980, most of them in public school systems. Of these, about 23,000 were superintendents and assistants, and about 127,000 were principals and assistants.

Every school system typically has at least one superintendent, who in turn generally has one or more assistants. Similarly, every school usually has a principal, and larger schools may have one or more assistant principals. Assistant principals are generally employed in secondary schools, which tend to be larger than elementary schools.

## Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require the certification of school administrators. Certification requirements may include good health and character, U.S. citizenship or State residency, graduate training in educational administration, and experience. Some States require school administrators to pass an examination in order to become certified. Information on specific requirements may be obtained from the Department of Education in each State.

Experience in education is virtually a must for the individual seeking a job as a school administrator. School superintendents usually are experienced administrators. Many are former principals who worked their way up through the administrative hierarchy. Principals and assistant principals are required by most most school systems to have several years of experience as classroom teachers. Teachers with varying backgrounds sometimes move directly into principalships. However, experience organizing and supervising school programs and activities is also an important qualification for principals and assistant principals, who may move into the position from another administrative job—such as curriculum specialist; financial advisor; or director of audiovisual aids, arts, or special education.

Graduate study in educational administration, preferably at the doctoral level, is usually required for a school district superintendent. In some larger districts, candidates for positions in the district's central administrative office may be expected to have a law degree or business degree in addition to a graduate degree in education. A master's degree in educational administration is the usual prerequisite for a position as a school principal or assistant principal.

The National Council for Accreditation of Teacher Education accredits graduate programs in educational administration on over 250 campuses. Programs provide specific preparation for elementary school principals, secondary school principals, or school district superintendents. Valuable courses within educational administration include school management, school law, school finance and budgeting, curriculum development and evaluation, systematic planning, supervision of instruction, research design and data analysis, personnel administration, community relations, politics in education, and leadership. A semester of internship and field experience is recommended.

In addition to experience and education, school administrators need certain personal characteristics in order to do their jobs well. Leadership skills and managerial ability are needed to direct the activities of the many people employed in a school or school system. Administrators need a personal philosophy of education which includes an understanding of the educational process and its goals, as well as familiarity with educational technology, curriculum development, and strategies for meeting educational needs. Because the various aspects of their jobs may be rather loosely defined, school administrators must also have a strong internal sense of direction and motivation. Moreover, they are frequently under fire from many different groups, making self-confidence and the ability to withstand criticism essential. Finally, since their work involves dealing with a wide range of people, communications skills and the ability to get along with different groups are crucial.

Because administrative competence is such an important trait for a school administrator, an applicant's past work record and reputation are extremely important when hiring decisions are made.

## Job Outlook

Little change in employment of school administrators is expected through the 1980's. Nearly all job openings will result

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from the need to replace administrators who transfer to other occupations, retire, or die.

Due to consolidation, both the number of school districts and the total number of schools have declined for over 40 years. The trend is expected to continue. However, the implications of consolidation for employment of school administrators are mixed: While some administrative positions are lost, others–particularly for assistants–are created as a result of the increased size and complexity of the consolidated units. However, public education is under strong pressure from taxpayers to limit spending increases, and budget constraints could limit the expansion of administrative staffs in some consolidated units.

Enrollments declined in elementary and secondary schools during the 1970's. They are expected to begin rising again in the mid-1980's, although the increase in the number of students will occur only in the elementary schools. The number of secondary school students will continue to decline until after 1990. Therefore, the need for elementary school principals may well be greater than the need for secondary school principals and assistants.

In spite of some new openings for principals that may occur at the elementary school level, competition for school administrative jobs is expected to remain keen throughout the decade. Large numbers of teachers and other school personnel obtained graduate degrees in education or educational administration during the 1970's. Many of these–whether prompted by "burn out," dissatisfaction with the classroom environment, or simply attracted by the wider range of duties, greater responsibilities, and higher salaries of a position in the administrative hierarchy–can be expected to compete for positions in the field of educational administration.

## Earnings

Salaries of school administrators vary according to position, level of responsibility, and the size and geographic location of the school or school district. In general, salaries are highest in the Far West and Mid-Atlantic States and lowest in the Southeast. According to the Educational Research Service, Inc., average salaries for selected school administrators in 1980-81 were as follows:

| | |
|---|---|
| Superintendent | $43,001 |
| Deputy or associate superintendent | 41,117 |
| Assistant superintendent | 36,633 |
| Senior high school principal | 32,231 |
| Senior high school assistant principal | 27,285 |
| Junior high/middle school principal | 30,401 |
| Junior high/middle school assistant principal | 26,045 |
| Elementary school principal | 27,923 |
| Elementary school assistant principal | 23,118 |

## Related Occupations

School administrators need organizational and leadership skills in order to manage people, programs, and financial resources successfully. The same combination of professional competence and managerial effectiveness is needed for top administrative positions in the areas of health, welfare, religion, and recreation. Related occupations include hospital administrators, academic deans, directors of agencies on aging, library directors, college or university department heads, recreation and parks directors, and museum curators.

# Underwriters

(D.O.T. 169.167-058)

## Nature of the Work

Insurance companies assume billions of dollars in risks each year by transferring the risk of loss from their policyholders to themselves. Underwriters appraise and select the risks their company will insure. (The term underwriter sometimes is used in referring to insurance agents; see the statement on insurance agents and brokers elsewhere in the *Handbook* for a discussion of that occupation.)

Underwriters decide whether their companies will accept risks after analyzing information in insurance applications, reports from loss control consultants, medical reports, and actuarial studies (reports that describe the probability of insured loss). Their companies may lose business to competitors if they appraise risks too conservatively or may have to pay more claims if their underwriting actions are too liberal.

When deciding that an applicant is an acceptable risk, an underwriter may outline the terms of the contract, including the amount of the premium. Underwriters frequently correspond with policyholders, agents, and managers about policy cancellations or other requests for information. In addition, they sometimes accompany salespeople on appointments with prospective customers.

Most underwriters specialize in one of three major categories of insurance: Life, property and liability, or health. They further specialize in group or individual policies. The property and liability underwriter specializes by type of risk insured, such as fire, automobile, marine, or workers' compensation. In cases where casualty companies insure in a single "package" policy, covering various types of risks however, the underwriter must be familiar with different lines of insurance. Some underwriters, called commercial account underwriters, handle business insurance exclusively. They often evaluate a firm's entire operation in appraising its insurance application.

An increasing proportion of insurance sales is being made through group contracts. A standard group policy insures all persons in a specified group through a single contract at uniform premium rates, generally for life or health insurance protection. The group underwriter analyzes the overall composition of the group to be sure that total risk is not excessive. Another type of group policy provides members of a group—a labor union, for example—with individual policies reflecting their individual needs. These generally are casualty policies such as those covering automobiles. The casualty underwriter analyzes the application of each group member and makes individual appraisals. Some group underwriters meet with union or employer representatives to discuss the types of policies available to their group.

## Working Conditions

Underwriters have desk jobs that require no unusual physical activity. Their offices generally are comfortable and pleasant. Although some overtime may be required, the normal workweek is 35-40 hours. Underwriters occasionally may attend meetings away from home for several days.

## Employment

About 76,000 persons worked as insurance underwriters in 1980. Over three-fourths were property and liability underwriters in regional or home offices; most life insurance underwriters were in home offices in a few large cities, such as New York, San Francisco, Chicago, Dallas, Philadelphia, and Hartford.

## Training, Other Qualifications, and Advancement

For beginning underwriting jobs, most large insurance companies seek college graduates who have a degree in liberal arts or business administration, but a major in almost any field provides a good general background. Some small companies hire persons without a college degree for underwriter trainee positions. In addition, some high school graduates who begin as underwriting clerks may be trained as underwriters after they demonstrate an aptitude for the work.

Underwriter trainees begin by evaluating routine applications under the close supervision of an experienced risk appraiser. They study claim files to become familiar with factors associated with certain types of losses. As they develop the necessary judgment, they are assigned policy applications that are more complex and have a greater face value.

Continuing education is necessary for the underwriter to advance. Insurance companies generally pay tuition for successfully completed underwriting courses; some also offer salary increases. Independent study programs are available through the American Institute of Property and Liability Underwriters, the American College of Life Underwriters, the Academy of Life Underwriters, the Health Insurance Association of America, and the Life Office Management Association. Experienced underwriters can qualify as a "fellow" of the Academy of Life Underwriters by passing a series of examinations and com-

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pleting a paper on a topic in the underwriting field. Examinations are given by the Institute of Home Office Underwriters and the Home Office Life Underwriters Association. Designation as a "fellow" is recognized as a mark of achievement in the underwriting field.

Underwriting can be a satisfying career for persons who like working with detail and enjoy evaluating information. In addition, underwriters must be able to make prompt decisions and communicate effectively. They must also be imaginative and aggressive, especially when they have to get information from outside sources.

Experienced underwriters who complete courses of study may advance to chief underwriter or underwriting manager. Some underwriting managers are promoted to senior managerial jobs.

## Job Outlook

Employment of underwriters is expected to rise about as fast as the average for all occupations through the 1980's as insurance sales continue to expand. Each year many jobs will become available as the need for underwriters grows and as those who die, retire, or transfer to other work are replaced.

Several factors underlie the expected growth in the volume of insurance and the resulting need for underwriters. Over the next decade, many more workers will enter the 25-54 age group. People in this age group have the greatest need for life and health insurance and protection for homes, automobiles, and other valuables. A growing demand for insurance coverage for working women is also expected. Growing security consciousness should also contribute to demand for more insurance protection. New or expanding businesses will need protection for new plants and equipment, insurance for workers' compensation, product liability, and mandatory insurance against long-term gradual environmental damage caused by hazardous waste. Competition among insurance companies and changes in regulations affecting investment profits also are expected to increase the need for underwriters.

Since insurance is usually regarded as a necessity regardless of economic conditions, underwriters are unlikely to be laid off during a recession.

Underwriter reviewing application for insurance policy.

## Earnings

Life insurance underwriters with some experience averaged about $17,000 a year in 1980, according to a Life Office Management Association (LOMA) survey. Senior life underwriters averaged $25,000, while senior group underwriters earned average salaries of about $28,000. In most cases, underwriters in larger companies earned higher salaries.

A survey of property and liability insurance companies showed that underwriters earned median salaries of $16,000 to $17,000 in 1980. Earnings varied by specialty, however: personal lines underwriters earned median salaries of $15,800, while those specializing in surety bonds earned $19,400. Senior underwriters earned substantially higher incomes—personal lines underwriters received median salaries of $20,500 while those specializing in commercial lines earned $20,300 a year. Underwriting supervisors in property and liability companies received median salaries between $22,000 and $24,000 a year in 1980.

Most insurance companies have liberal vacation policies and other employee benefits. Almost all insurance companies provide employer-financed group life and retirement plans.

## Related Occupations

Underwriters make decisions on the basis of financial data. Other workers with the same type of responsibility include auditors, loan officers, credit managers, and real estate appraisers.

## Sources of Additional Information

General information about a career as an insurance underwriter is available from the home offices of many life insurance and property and liability insurance companies. Information about career opportunities as an underwriter also may be obtained from:

American Council of Life Insurance, 1850 K St. NW., Washington, D.C. 20006.

Insurance Information Institute, 110 William St., New York, N.Y. 10038.

Alliance of American Insurers, 20 N. Wacker Dr., Chicago, Ill. 60606.

The National Association of Independent Insurers, Public Relations Department, 2600 River Rd., Des Plaines, Ill. 60018.

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# Engineers, Surveyors, and Architects

## Nature of the Work

Engineers, surveyors, and architects do planning and design. Engineers design machines, processes, systems, and structures. Architects design buildings and other structures, landscape architects design outdoor areas, and surveyors and surveying technicians measure and lay out land boundaries. Architects, engineers, and surveyors often work together on building projects. Architects concentrate on the visual appearance of buildings as well as the needs of owners and occupants. Engineers design the structural parts of the building, including its mechanical and electrical systems. Surveyors lay out the building's boundaries.

Engineers apply scientific and mathematical theories and principles to solve practical technical problems. Most work in one of the more than 25 specialties recognized by professional societies. Electrical, mechanical, civil, chemical, and aerospace engineering are the largest. Although many engineers design and develop technical products and systems, others work in testing, production, operations, and maintenance.

Architects also apply scientific and mathematical theories and principles to design and construct buildings which are esthetically appealing and safe, and which meet the needs of their client.

Landscape architects apply the principles of botany and design in the planning of functional and esthetically pleasing outdoor areas. Like architects, they also work closely with their clients.

Surveyors and surveying technicians use mathematical and scientific principles to measure and lay out land areas and establish boundaries. They also research deeds, write legal descriptions of land, and collect information for maps and charts.

## Training, Other Qualifications, and Advancement

Surveyors and surveying technicians usually qualify for their work with a combination of postsecondary school courses and on-the-job training. Some obtain a junior college degree in surveying. The generally accepted standard for engineers is a bachelor's degree in engineering, although those with degrees in natural science or mathematics may sometimes qualify as engineers. A bachelor's degree in architecture is necessary to become an architect. To offer architectural services to the public, architecture graduates must have several years' work experience and pass a licensing examination. The minimum educational requirement for a landscape architect is a bachelor's degree in landscape architecture.

## Job Outlook

All occupations in this group are expected to grow as fast as or faster than the average for all occupations through 1990. In architecture, however, growth will not be rapid enough to provide jobs for all of those seeking to enter the occupation.

# Architects

(D.O.T. 001.061-010)

## Nature of the Work

Designing a building involves far more than planning an attractive exterior made of stone, steel and glass, or other materials. Buildings must be safe as well as attractive and suit the needs of the people who use them. Architects take all these things into consideration and design buildings that are esthetically appealing, safe, and functional.

Architects provide a wide variety of professional services to individuals and organizations planning a building project. Architects are involved in all phases of development, from the initial discussion of general ideas with the client through construction. Their duties require a variety of skills—design, engineering, managerial, and supervisory.

The architect and client first discuss the purposes, requirements, and cost of a project. The architect then prepares carefully scaled drawings that show the mechanical as well as the structural components of the building.

If the schematic drawings are accepted, the architect develops a final design showing the floor plans and the structural details of the project. For example, in designing a school, the architect determines the width of corridors and stairways so that students may move easily from one class to another; the type and arrangement of storage space; and the location and size of classrooms, laboratories, lunchroom or cafeteria, gymnasium, and administrative offices.

Next the architect prepares working drawings showing the exact dimensions of every part of the structure and the location of plumbing, heating units, electrical outlets, and air-conditioning.

Architects also specify the building materials and, in some cases, the interior furnishings. In all cases, the architect's design and specifications must conform to local and State building codes, zoning laws, fire regulations, and other ordinances, including those that require easy access by handicapped persons.

Throughout the planning stage the architect may make changes to satisfy the client. A client may decide that the design is too expensive and ask the architect to make modifications, or the client may propose additions to the original plan. Redesigning to suit the client requires flexibility, and some-

An architect has to understand clients' needs.

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times considerable patience, on the part of the architect.

After all drawings are completed, the architect assists the client in selecting a contractor and negotiating the construction contract. As construction proceeds, the architect visits the building site from time to time to ensure that the contractor is following the design and using the specified materials. The architect also checks to be sure that the quality of work meets the specified standards. The job is not complete until construction is finished, all required tests are made, construction costs are paid, and guarantees are received from the contractor.

Architects design a wide variety of structures, such as houses, churches, hospitals, office buildings, and airports. They also design multibuilding complexes for urban renewal projects, college campuses, industrial parks, and new towns. Besides designing structures, architects also may help in selecting building sites, preparing cost and land-use studies, and conducting long-range planning for land development.

When working on large projects or for large architectural firms, architects often specialize in one phase of the work, such as designing or administering construction contracts. This often requires working with engineers, urban planners, landscape architects, and others.

## Working Conditions

Most architects spend a great deal of their time at the drawing board in well-equipped offices. It is at the drawing board that architects do most of their more creative and imaginative work. The majority of their time, however, is spent interviewing clients; discussing the design, construction procedures, or building materials of a project with other architects, engineers, and contractors; and making inspections at construction sites.

## Employment

About 79,500 architects were employed in 1980. This included architecture school graduates who were not yet registered (licensed), although they worked in the field under the supervision of licensed architects.

Most architects work for architectural firms—most of which employ fewer than 10 workers—or for builders, real estate firms, or other businesses that have large construction programs. Some work for government agencies responsible for housing, planning, or community development, mainly for the Departments of Defense, Interior, and Housing and Urban Development, as well as the General Services Administration.

A large proportion of architects are located in New York, Chicago, Los Angeles, Boston, and Washington where many large architectural firms are located. Increasing numbers of architects are finding employment in areas of the South and Southwest that are attracting new business and residential construction such as Houston, Dallas-Ft. Worth, Phoenix and a number of Florida cities.

## Training, Other Qualifications, and Advancement

All States and the District of Columbia require individuals to be licensed before they may call themselves architects or contract for providing architectural services. To qualify for the licensing exam, a person generally must have at least a Bachelor of Architecture degree followed by 3 years of acceptable practical experience in an architect's office. As a substitute for formal education, most States accept additional experience (usually 13 years) and successful completion of a qualifying test for admission to the licensing examination. Many architecture school graduates work in the field even though they are not licensed. However, a registered architect is required to take legal responsibility for all work.

In 1980, the National Architectural Accrediting Board had accredited 92 programs of the 101 schools offering professional degrees in architecture. Most of these schools offer either a 5-year curriculum leading to a Bachelor of Architecture degree or a 6-year curriculum leading to a Master of Architecture degree. Students also may transfer to professional degree programs after completing a 2-year junior or community college program in architecture. Many architecture schools also offer graduate education for those who already have their first professional degree. Although such graduate education is not essential for practicing architects, it often is desirable for those in research and teaching. A typical college architecture program includes courses in architectural theory, design, graphics, engineering, and urban planning, as well as in English, mathematics, physics, economics, and the humanities.

Persons planning a career in architecture should be able to work independently, have a capacity for solving technical problems, and be artistically inclined. They also must be prepared to work in the competitive environment of business where leadership and ability to work with others are important. Working for architects or building contractors during summer vacations is useful for gaining practical knowledge.

New graduates usually begin as drafters in architectural firms, where they prepare architectural drawings and make models of structures under the direction of a registered architect. They also may work as designers, construction contract administrators, or specification writers who prepare documents that specify the building materials, their method of installation, the quality of finishes, required tests, and many other related details. Employees who become associates in their firms may receive, in addition to a salary, a share of the profits. Often, however, the architect's goal is to own his or her own business.

## Job Outlook

Architects are expected to face competition for jobs through the 1980's. Although employment of architects is expected to rise faster than the average for all workers during this period, the number of degrees granted in architecture is expected to continue growing as well. If so, supply in this small field could exceed the number of job openings arising from growth in demand for architects and from transfers to other occupations, retirements, and deaths.

Demand for architects is highly dependent upon the level of new construction, and the anticipated rapid growth of nonresidential construction is expected to be a major source of job opportunities through the 1980's. Any significant upswing or downturn in building could temporarily alter demand, however. Indeed, the cyclical nature of construction activity leads some architects to move in and out of the field from time to time. Their design skills and familiarity with building materials and techniques enable them to move into related areas such as graphic design, advertising, visual arts, product design, construction contracting and supervision, and real estate.

Although most job openings will be in architectural firms, some will occur in construction firms, colleges and universities, and government agencies. Construction firms employ architects to oversee various aspects of project design and actual construction. In colleges and universities, the anticipated high level of enrollments in architecture and environmental design programs may create a demand for additional faculty. Public concern about the quality of the environment may heighten the demand for community and environmental planning projects. This may create opportunities in consulting firms and planning agencies. (See the statement on urban planners elsewhere in the *Handbook*.)

## Earnings

The average salary for experienced architects in 1980 was well over $25,000 a year, according to the limited information available. Newly hired architects receive salary increases as they work toward passing the licensing examination. For example, graduates with a master's degree started at about $13,000 to $15,000 a year in 1980. Architects with 3 years' experience who had passed the exam earned from $18,000 to $20,000.

Architects with well-established private practices generally earn much more than even highly paid salaried employees of architectural firms. Some architects with many years of experience and good reputations earn well over $40,000 a year. However, architects starting their own practices may have difficulty getting established and may go through a period when their expenses are greater than their income. Annual income may fluctuate due to changing business conditions.

In 1980, the average salary for architects working in the Federal Government was about $32,000.

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## Related Occupations

Architects are concerned with the design and construction of buildings and related structures. Others who engage in related work are building contractors, civil engineers, urban planners, interior designers, industrial designers, landscape architects, drafters, and surveyors.

## Sources of Additional Information

General information about careers in architecture, including a catalog of publications, can be obtained from:

The American Institute of Architects, 1735 New York Ave. NW., Washington, D.C. 20006.

Specific questions on education careers should be addressed to:

The Association of Collegiate Schools of Architecture, Inc., 1735 New York Ave. NW., Washington, D.C. 20006.

Information about the licensing examinations can be obtained from:

The National Council of Architectural Registration Boards, 1735 New York Ave. NW., Suite 700, Washington, D.C. 20006.

# Landscape Architects

(D.O.T. 001.061-018)

## Nature of the Work

Everyone enjoys attractively designed residential areas, public parks, college campuses, shopping centers, and industrial parks. Landscape architects design these areas so that they are not only functional but beautiful. They plan the location of buildings, roads, walks, and the arrangement of vegetation and other features of open spaces. They also redesign streets to limit automobile traffic and improve pedestrian access and safety. They sometimes supervise the construction of these projects. Natural resource and energy conservation are other important objectives that require a knowledge of natural processes as well as artistic principles.

In planning a site, landscape architects first consider the nature and purpose of the project and the funds available. They analyze the natural elements of the site, such as climate, soils, slope of the land, natural drainage ways, and vegetation. They assess the usefulness of existing buildings, roads, walkways, and utility lines to the project. They observe the sunny parts of the site at different times of the day, views on and from the site, and other landscape features. They establish the best possible physical relationship between the people and the buildings, trees, shrubs, water, roads, drainage, and lights. Then, working as part of a design team or as consultants to the project architect or engineer, they draw up detailed plans of the site that include written reports, sketches, models, photographs, land-use studies, and cost estimates. If the plans are approved, landscape architects prepare working drawings showing all existing and proposed features. They outline in detail the methods of construction and draw up a list of necessary materials. They then may invite landscape contractors to bid for the work. After the contractor has been picked, they supervise the construction to insure proper completion of the job.

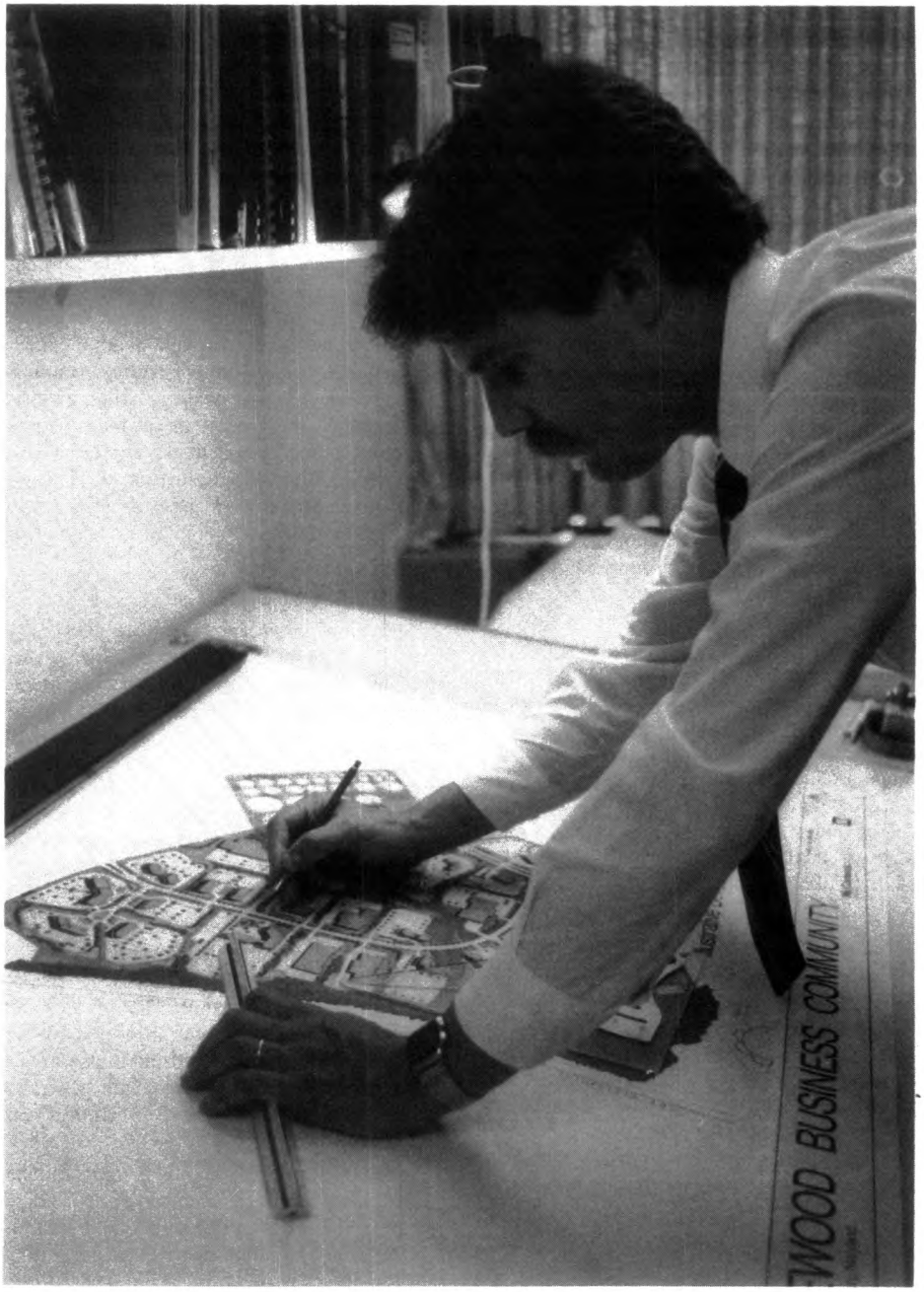
Some landscape architects specialize in parks and playgrounds; other specialize in hotels and resorts, shopping centers, or public housing. Still others work primarily in regional planning and resource management, feasibility, environmental impact and cost studies, or site construction.

## Working Conditions

Landscape architects spend much of their time in offices preparing drawings, models, and cost estimates, and discussing them with clients. But the time in the office is balanced by the time they spend outdoors, studying and planning sites, and supervising landscape projects.

## Employment

An estimated 15,000 persons worked as landscape architects in 1980. Most had their own businesses or worked for architectural, landscape architectural, or engineering firms. Others were employed by government agencies concerned with forest management, water storage, public housing, city planning,




Landscape architect prepares a drawing showing location of buildings, roads, walkways, shrubs, and trees.

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urban renewal, highways, parks, and recreation. The Federal Government employed over 650 landscape architects, mainly in the Departments of Agriculture, Defense, Transportation, Interior, and the Veterans Administration. Some landscape architects worked for landscape contractors, and a few taught in colleges and universities.

Most landscape architects worked in large metropolitan areas, primarily on the East and West Coasts. However, employment opportunities have recently been growing in the Southwest and Southeast.

## Training, Other Qualifications, and Advancement

A bachelor's degree in landscape architecture, which takes 4 or 5 years, is usually the minimum educational requirement for entering the profession. The American Society of Landscape Architects accredited 44 college and university programs in landscape architecture in 1981. About 60 other schools also offer programs or courses in landscape architecture.

A person interested in landscape architecture should take high school courses in mechanical or geometrical drawing, art, botany, and mathematics through trigonometry. Written and spoken English is important, since landscape architects must be able to communicate their ideas to clients and make presentations before large groups.

College courses in this field include technical subjects such as surveying, landscape design and construction, graphics, structural design, and city and regional planning. Other courses include horticulture and botany as well as science, mathematics, English, and the social sciences. Most college programs also include field trips to study examples of landscape architecture.

More than 35 States require a license, based on the results of a uniform national licensing examination, for independent practice of landscape architecture. Admission to the licensing examination usually requires a degree from an accredited school of landscape architecture plus 1 to 4 years of experience. Lengthy apprenticeship training (6-8 years) under experienced and licensed landscape architects sometimes may be substituted for college training.

Persons planning careers in landscape architecture should appreciate nature and be creative and have artistic talent. Landscape architects employ lines, colors, textures, spaces, and light to create an attractive land-use plan. Self-employed landscape architects must understand business practices. A summer job with a landscape architect or landscape contractor provides practical experience and may help to obtain employment after graduation.

New graduates usually begin by tracing drawings and doing other simple drafting work. After gaining experience, they help prepare specifications and construction details and handle other aspects of project design. After 2 or 3 years, they can usually carry a design through all stages of development. Highly qualified landscape architects may become associates in private firms; landscape architects who progress this far, however, often open their own offices.

## Job Outlook

Employment of landscape architects is expected to grow faster than the average for all occupations through the 1980's. In addition, new entrants will be needed as replacements for landscape architects who retire or die.

The level of new construction plays a major role in determining employment of landscape architects. Anticipated growth in construction is expected to spur demand over the long run. However, the cyclical nature of construction may cause employment to fluctuate from year to year. During economic downturns, some landscape architects may be laid off or may have to move into related areas of work in design or horticulture.

Another significant factor contributing to the increased demand for landscape architects is the growth in city and regional environmental planning. Metropolitan areas need landscape architects to plan efficient and safe land use for growing populations. Legislation to promote environmental protection has spurred demand for landscape architects to help plan and design transportation systems, outdoor recreation areas, and land reclamation projects, as well as to ensure safe industrial growth. Laws dealing with historic preservation and coastal zone management are also sources of demand in this field. However, anticipated reduction of Federal Government support for these projects could dampen the demand.

## Earnings

Beginning landscape architects generally earned from about $13,500 to $18,000 a year in 1980. Experienced landscape architects earned between $18,000 and $30,000 a year, although some highly skilled persons earned salaries of over $40,000 a year. Earnings of self-employed landscape architects ranged from $15,000 a year to about $40,000 a year, depending on the individual's educational background, experience, and geographic location.

The Federal Government paid new graduates with a bachelor's degree annual salaries of about $15,900 or $19,700 in 1981 depending on their qualifications. Those with an advanced degree had a starting salary of about $22,900. Experienced landscape architects in the Federal Government generally earned between $24,700 and $35,000 a year in 1981.

Salaried employees both in government and in landscape architectural firms usually work regular hours, although employees of private firms may also work overtime during seasonal rush periods to meet a deadline. Self-employed persons often work long hours.

## Related Occupations

A sensitivity to beauty is essential in combining the elements of design and nature to develop a composite landscape project. Others whose work requires similar design skills include architects, ornamental horticulturists, environmental planners, urban planners, and land-use planners.

## Sources of Additional Information

Additional information, including a list of colleges and universities offering accredited programs in landscape architecture, is available from:

American Society of Landscape Architects, 1733 Connecticut Ave. NW., Washington, D.C. 20009.

For information on a career as a landscape architect in the Forest Service, write to:

U.S. Department of Agriculture, Forest Service, Division of Personnel Management, P.O. Box 2417 Room 906 R.P.-E, Washington, D.C. 20013.

# Surveyors and Surveying Technicians

(D.O.T. 018.167-010, -014, -018, -026 and -034 through -050; .261-018, -022, and -026; and .262-010)

## Nature of the Work

Surveyors, with the assistance of surveying technicians, establish official land boundaries, research deeds, write descriptions of land to satisfy legal requirements, assist in setting land valuations, measure construction and mineral sites, and collect information for maps and charts.

Surveys are usually conducted by a survey party to measure distances, directions, and angles between points and elevations of points, lines, and contours on the earth's surface. *Land surveyors* (D.O.T. 018.167-018), who may head one or more survey parties, are directly responsible for a party's activities and the accuracy of its work. They plan the fieldwork, select survey reference points, and determine the precise location of natural and constructed features of the survey project area. They record the results of the survey, verify the accuracy of data, and prepare sketches, maps, and reports.

A typical survey party is made up of the *party chief* (D.O.T. 018.167-010) and one to six assistants and helpers. The *party chief* leads the day-to-day work activities of the party. *Instrument assistants* (D.O.T. 018.167-034) adjust and operate surveying instruments such as the theodolite (used to measure horizontal and vertical angles) and electronic equipment used to measure distances. These workers also compile notes, sketches, and records of the data obtained from using these instruments.

Surveyors and surveying technicians may specialize in a particular type of survey.

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Many do land surveys to locate boundaries of a particular tract of land. They then prepare maps and legal descriptions for deeds, leases, and other documents. Those doing topographic surveys determine elevations, depressions, and contours of an area, and indicate distinguishing surface features such as farms, buildings, forests, roads, and rivers. *Geodetic surveyors* (D.O.T. 018.167-038) use special high-accuracy techniques, such as satellite observations, to measure large areas of the earth's surface. *Geophysical prospecting surveyors* (D.O.T. 018.167-042) mark sites for subsurface exploration, usually petroleum related. *Marine surveyors* (D.O.T. 018.167-046) survey harbors, rivers, and other bodies of water to determine shorelines, topography of the bottom, depth, and other features.

*Photogrammetrists* (D.O.T. 018.261-026) measure and interpret photographic images to determine the various physical characteristics of natural or constructed features of an area. By applying analytical processes and mathematical techniques to photographs from aerial, space, ground, and underwater locations, photogrammetrists are able to make detailed maps of areas that are inaccessible or difficult to survey by other methods. Control surveys on the ground are made to insure the accuracy of maps derived from photogrammetric techniques. *Mosaicists* (D.O.T. 018.261-022) and *map editors* (D.O.T. 018.261-018 and .262-010) help develop and verify maps and pictures from aerial photographs.

Closely related occupations that use surveying techniques in their work include geodesists (see statement on geophysicists elsewhere in the *Handbook*) and cartographers (see statement on geographers elsewhere in the *Handbook*).

Surveying technician makes measurements prior to construction.

## Working Conditions

Surveyors and surveying technicians usually work an 8-hour day, 5 days a week. Sometimes they work longer hours during the summer months when weather conditions are most suitable for surveying.

The work of a survey party is active and sometimes strenuous. Party members often stand for long periods and walk long distances or climb hills with heavy packs of instruments and equipment. They also are exposed to all types of weather. Occasionally they must commute long distances or find temporary housing near the survey site.

Surveyors spend considerable time on office duties, such as planning surveys, preparing reports and computations, and drawing maps.

## Employment

About 61,000 persons worked as surveyors or surveying technicians in 1980. Federal, State, and local government agencies employ about one-fourth of these workers. Among the Federal Government agencies are the U.S. Geological Survey, the Bureau of Land Management, the Army Corps of Engineers, the Forest Service, the National Ocean Survey, and the Defense Mapping Agency. Most surveyors and surveying technicians in State and local government agencies work for highway departments and urban planning and redevelopment agencies.

About 40 percent of all surveyors and surveying technicians work for construction companies and for engineering and architectural consulting firms. A sizable number either work for or own firms that conduct surveys for a fee. Surveyors and surveying technicians also work for crude petroleum and natural gas companies and for public utilities.

## Training, Other Qualifications, and Advancement

Most persons prepare for surveying work by combining postsecondary school courses in surveying with extensive on-the-job training. Some prepare by obtaining a college degree. Junior and community colleges, technical institutes, and vocational schools offer 1-, 2-, and 3-year programs in surveying. A few 4-year colleges offer bachelor's degrees specifically in surveying, while many others offer several courses in the field.

High school students interested in pursuing a career in surveying should take courses in algebra, geometry, trigonometry, drafting, and mechanical drawing.

High school graduates with no formal training in surveying usually start as surveyor helpers. After several years of on-the-job experience and some formal training in surveying, workers may advance to instrument assistant, then to party chief, and finally to licensed surveyor.

Beginners with postsecondary school training in surveying can generally start as instrument assistants. After gaining experience, they may advance to party chief, or become a licensed surveyor. In many instances, promotions to higher level positions are based on written examinations as well as experience.

Those interested in a career as a photogrammetrist usually need a bachelor's degree in engineering or a physical science. Most photogrammetry technicians have had some specialized postsecondary school training.

All 50 States require licensing of land surveyors. Licensing requirements are generally quite strict, because once licensed, surveyors can be held legally responsible for their work. Requirements for licensure vary among the States. Generally, the quickest route to licensure is a combination of 4 years of college, 2 to 4 years of experience, and a passing grade on the State licensing exam. In most States, persons also may qualify to take the licensing exam after 5 to 12 years of surveying experience. As a prerequisite to licensure, some States now require a bachelor's degree in surveying or in a closely related field such as civil engineering or forestry with courses in surveying. A few States allow such graduates to take the licensing examination without experience in the field.

Surveyors and surveying technicians should have the ability to visualize and understand objects, distances, sizes, and other abstract forms. Also, because mistakes can be very costly, surveyors must make mathematical calculations quickly and accurately while paying close attention to the smallest detail. Leadership qualities are important for surveyors who supervise others.

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Members of a survey party must be in good physical condition to work outdoors and carry equipment over difficult terrain. They also need good eyesight, coordination, and hearing to communicate over great distances by hand or voice signals.

## Job Outlook

Employment of surveyors and surveying technicians is expected to grow about as fast as the average for all occupations through the 1980's. In addition to openings arising from growth in the demand for these workers, many will result from the need to replace those who die, retire, or leave their jobs for other reasons.

In the long run, the anticipated growth in construction should create additional jobs for surveyors and surveying technicians who lay out streets, shopping centers, housing developments, factories, office buildings, and recreation areas. Construction and improvement of the Nation's roads and highways also should create new surveying positions. However, employment may fluctuate from year to year because construction activity is highly sensitive to changes in economic conditions.

## Earnings

In early 1981, high school graduates with little or no training or experience earned $9,000 annually as surveyor helpers with the Federal Government. Those with 1 year of related postsecondary training earned $9,800. Those with an associate degree that included courses in surveying generally started as instrument assistants with an annual salary of $11,000. The average annual Federal salary for surveying technicians in 1980 was $12,600. In early 1981, persons starting as land surveyors with the Federal Government earned $12,300 or $15,200 a year, depending on their qualifications. The average annual Federal salary for land surveyors in 1980 was $22,700.

Although salaries in private industry vary by geographic area, limited information indicates that salaries are generally comparable to those in Federal service.

## Related Occupations

Other occupations concerned with accurate measurement and delineation of land areas, coastlines, and natural and constructed features include cartographers, cartographic drafters, geodesists, and topographical drafters.

## Sources of Additional Information

Information about career opportunities, licensure requirements, and schools that offer training in surveying is available from:

American Congress on Surveying and Mapping, 210 Little Falls St., Falls Church, Va. 22046.

General information on careers in photogrammetry is available from:

American Society of Photogrammetry, 105 North Virginia Ave., Falls Church, Va. 22046.

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# Engineers

The work of engineers enables us to drive safer automobiles, travel in space, and prolong life. Future accomplishments could help increase available energy supplies, develop more pollution-free powerplants, and aid medical science in its fight against disease.

In 1980, about 1.2 million persons were employed as engineers. Engineering is the second largest profession, exceeded only by teaching. Most engineers specialize; more than 25 specialties are recognized by professional societies. Within the major branches are over 85 subdivisions. Structural, environmental, hydraulic, and highway engineering, for example, are subdivisions of civil engineering. Engineers also may specialize in the problems of one industry, such as motor vehicles, or in one field of technology, such as propulsion or guidance systems. This section, which contains an overall discussion of engineering, is followed by separate statements on 12 branches of the profession—aerospace, agricultural, biomedical, ceramic, chemical, civil, electrical, industrial, mechanical, metallurgical, mining, and petroleum engineering.

## Nature of the Work

Engineers apply the theories and principles of science and mathematics to practical technical problems. Often their work is the link between a scientific discovery and its application. Engineers design machinery, products, systems, and processes for efficient and economical performance. They develop electric power, water supply, and waste disposal systems. They design industrial machinery and equipment for manufacturing goods, and heating, air-conditioning, and ventilation equipment for more comfortable living. Engineers also develop scientific equipment to probe outer space and the ocean depths, design defense and weapons systems for the Armed Forces, and design, plan, and supervise the construction of buildings, highways, and rapid transit systems. They also design and develop consumer products such as automobiles, television sets, refrigerators, and electronic games, and systems for control and automation of manufacturing, business, and management processes.

Engineers must consider many factors in developing a new product. For example, in developing devices to reduce automobile exhaust emissions, engineers must determine the general way the device will work, design and test all components, and fit them together in an integrated plan. They must then evaluate the overall effectiveness, cost, reliability, and safety of the new device. This process applies to products as different as lawnmowers, electronic computers, industrial machinery, and toys.

In addition to design and development, many engineers work in testing, production, operations, or maintenance. They supervise production processes in factories, determine the causes of breakdowns, and test newly manufactured products to maintain quality. They also estimate the time and cost to complete projects. Some work in engineering administration and management, or in sales jobs where an engineering background enables them to discuss the technical aspects of a product and assist in planning its installation or use. (See statement on manufacturers' sales workers elsewhere in the *Handbook*.) Some engineers work as consultants. Others with advanced degrees teach in colleges and universities.

Engineers in each branch apply their knowledge to many fields. Electrical engineers, for example, work in the medical, computer, missile guidance, or power distribution fields. Because complex problems cut across traditional fields, engineers in one field often work closely with specialists in scientific, other engineering, and business occupations.

Engineers often use calculators and computers to solve mathematical equations which describe how a machine, structure, or system operates. Engineers also spend a great deal of time writing reports and consulting with other engineers. Complex projects may require many engineers, each working with a small part of the job under the supervision of an engineering project manager. Other projects may be the responsibility of one engineer.

## Working Conditions

Some engineers are at a desk almost all of the time but others work in research laboratories or in industrial plants. Engineers in specialities such as civil engineering may work outdoors part of the time. A few engineers travel extensively to plants or construction sites. Some work overtime to meet deadlines, often without additional compensation.

## Employment

About half of all engineers work in manufacturing industries—most in electrical and electronic equipment, aircraft and parts, machinery, chemicals, scientific instruments, primary metals, fabricated metal products, and motor vehicle industries. In 1980, about 400,000 were employed in nonmanufacturing industries, primarily in construction, public utilities, engineering and architectural services, and business and management consulting services.

Federal, State, and local governments employed almost 160,000 engineers. Over half of these worked for the Federal Government, mainly in the Departments of Defense, Interior, Energy, Agriculture, and Transportation, and in the National Aeronautics and Space Administration. Most engineers in State and local government agencies worked in highway and public works departments.

Colleges and universities employed over 40,000 engineers in research and teaching and a small number worked for nonprofit research organizations.

Engineers are employed in every State, in small and large cities, and in rural areas. Some branches of engineering are concentrated in particular industries and geographic areas, as discussed in the statements later in this chapter.

## Training, Other Qualifications, and Advancement

A bachelor's degree in engineering is generally acceptable for beginning engineering jobs. College graduates with a degree in a natural science or mathematics also may qualify for some jobs. Experienced technicians with some engineering education are occasionally able to advance to some types of engineering jobs.

Many colleges have 2- or 4-year programs leading to degrees in engineering technology which prepare students for practical design and production work rather than for jobs that require more theoretical scientific and mathematical knowledge. Graduates of such 4-year engineering technology programs may get jobs similar to those obtained by engineering bachelor's degree graduates. However, some employers regard them as having skills between those of a technician and an engineer.

Graduate training is essential for most teaching jobs but is not needed for the majority of other entry level engineering jobs. Many engineers obtain a master's degree however, because an advanced degree often is desirable for promotion or for learning new technology. Some specialties, such as nuclear, environmental, or biomedical engineering, are taught mainly at the graduate level.

About 250 colleges and universities offer a bachelor's degree in engineering, and over 80 colleges offer a bachelor's degree in engineering technology. Although most institutions offer programs in the larger branches of engineering, only a few offer some of the smaller specialties. Therefore, students should investigate curriculums before selecting a college. Admissions requirements for undergraduate engineering schools usually include courses in advanced high school mathematics and the physical sciences.

In a typical 4-year curriculum, the first 2 years are spent studying basic sciences—mathematics, physics, chemistry, and introductory engineering—and the humanities, so-

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cial sciences, and English. In the last 2 years, most courses are in engineering. Some programs offer a general engineering curriculum; students then choose a specialty in graduate school or acquire it on the job.

Some engineering curriculums require more than 4 years to complete. A number of colleges and universities offer 5-year master's degree programs. In addition, several engineering schools have arrangements whereby a student spends 3 years in a liberal arts college studying preengineering subjects and 2 years in the engineering school and receives a bachelor's degree from each.

Some 5- or even 6-year cooperative plans combine classroom study and practical work experience. In addition to gaining useful experience, students can thereby finance part of their education. To keep up with rapid advances in technology, engineers often continue their education throughout their careers by attending evening classes in colleges and universities or in employer-sponsored programs.

All 50 States and the District of Columbia require licensing for engineers whose work may affect life, health, or property, or who offer their services to the public. In 1980, over 400,000 engineers were registered. Registration generally requires a degree from an accredited engineering program, 4 years of relevant work experience, and passing a State examination. Some States will not register those with degrees in engineering technology.

Beginning engineering graduates usually do routine work under the close supervision of experienced engineers and may also receive formal classroom or seminar-type training. As they gain experience, they then are assigned responsibility for more difficult tasks. Some move to managerial or administrative positions within engineering; others leave engineering for non-technical managerial, administrative, and sales jobs. Some engineers obtain graduate degrees in business administration to improve advancement opportunities; others obtain law degrees and become patent attorneys. Many high level executives in government and industry began their careers as engineers.

Engineers should be able to work as part of a team and should have creativity, an analytical mind, and a capacity for detail. In addition, engineers should be able to express themselves well—both orally and in writing.

## Job Outlook

Employment opportunities for those with degrees in engineering are expected to be good through the 1980's. Recent graduates will be in especially great demand. In addition, there may be some opportunities for college graduates from related fields in certain engineering jobs.

Employment of engineers is expected to increase faster than the average for all occupations through the 1980's. In addition to job openings created by growth in the demand for engineers, many openings will result from the need to replace engineers who transfer to management, sales, and other professional jobs, retire, or die.

Much of the projected growth in requirements for engineers will stem from the expected higher levels of investment in industrial plants and equipment to meet the demand for more goods and services and to increase productivity. Growth also is expected in defense-related industries as a result of anticipated sharp increases in defense budgets. More engineers will be required in energy-related activities to develop sources of energy as well as to design energy-saving systems for automobiles, factories, and homes and other buildings, and to solve environmental problems. If investment and defense spending levels are significantly different from those assumed, however, the outlook for engineers will be altered.

In industries such as electronics and aerospace, large cutbacks in defense or research and development expenditures may result in layoffs for engineers. Engineers may also be laid off if the demand for their specialty declines. Layoffs could be a particular problem for older engineers, who sometimes face difficulties in finding other engineering jobs. A career in one of the more stable industries or engineering specialties and continuing education may minimize these difficulties. Despite these problems, over the long run the number of people seeking jobs as engineers is expected to about equal the number of job openings.

(The outlook for various branches is discussed in the separate statements that follow this introductory section.)

## Earnings

According to the College Placement Council, engineering graduates with a bachelor's degree and no experience averaged $22,900 a year in private industry in 1981; those with a master's degree and no experience, $25,500 a year; and those with a Ph.D., $32,800. Starting offers for those with the bachelor's degree vary by branch as shown in the accompanying table.

**Table 1. Average starting salaries for engineers by branch, 1980.**

| Branch | Salary |
|---|---|
| Petroleum | $23,844 |
| Chemical engineering | 21,612 |
| Mining engineering | 20,808 |
| Metallurgical engineering | 20,712 |
| Mechanical engineering | 20,436 |
| Electrical engineering | 20,280 |
| Industrial engineering | 19,860 |
| Aeronautical engineering | 19,776 |
| Civil engineering | 18,648 |

SOURCE: College Placement Council.

In the Federal Government in 1981, engineers with a bachelor's degree and no experience could start at $15,947 or $19,747 a year, depending on their college records. Those with a master's degree could start at $22,925, and those having a Ph.D., degree could begin at $24,763. Higher salaries were offered for certain specialties and in a few geographic areas. The average salary for experienced engineers in the Federal Government was about $32,516 in 1980.

For a 9-month academic college year in 1980, faculty members with 5 years' experience beyond the bachelor's degree received about $18,650; those with 18 to 20 years' experience beyond the bachelor's degree received about $25,100. Some faculty members receive additional income from consulting, writing, or teaching summer school. (See statement on college and university teachers elsewhere in the *Handbook*.)

According to an Engineering Manpower Commission survey, engineers with 20 years of experience averaged $34,000 in 1980. Some in management earned much more.

## Related Occupations

Much of the work of physical scientists, life scientists, mathematicians, engineering and science technicians, and architects is related to engineering.

## Sources of Additional Information

General information on engineering careers—including engineering school requirements, courses of study, and salaries—is available from:

Engineering Manpower Commission of American Association of Engineering Societies, 345 E. 47th St., New York, N.Y. 10017.

National Society of Professional Engineers, 2029 K St. NW., Washington, D.C. 20006.

Society of Women Engineers, 345 E. 47th St., New York, N.Y. 10017.

Societies representing the individual branches of engineering are listed in this chapter. Each can provide information about careers in the particular branch.

# Aerospace Engineers

(D.O.T. 002.061, .151, .167, and 090.227-010)

## Nature of the Work

Aerospace engineers design, develop, test, and help produce commercial and military aircraft, missiles, and spacecraft. They play an important role in advancing technology in commercial aviation, defense systems, and space exploration.

Aerospace engineers often specialize in areas like structural design, navigational guidance and control, instrumentation and communication, or production methods. They also may specialize in one type of aerospace product, such as passenger planes, helicopters, satellites, or rockets.

## Employment

About 68,000 aerospace engineers were employed in 1980, mainly in the aircraft and parts industry. Some worked for Federal Government agencies, primarily the Depart-

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ment of Defense and the National Aeronautics and Space Administration. A few worked for commercial airlines, consulting firms, and colleges and universities.

Employment of aerospace engineers is concentrated in States with large aerospace manufacturers, especially California and Washington.

## Job Outlook

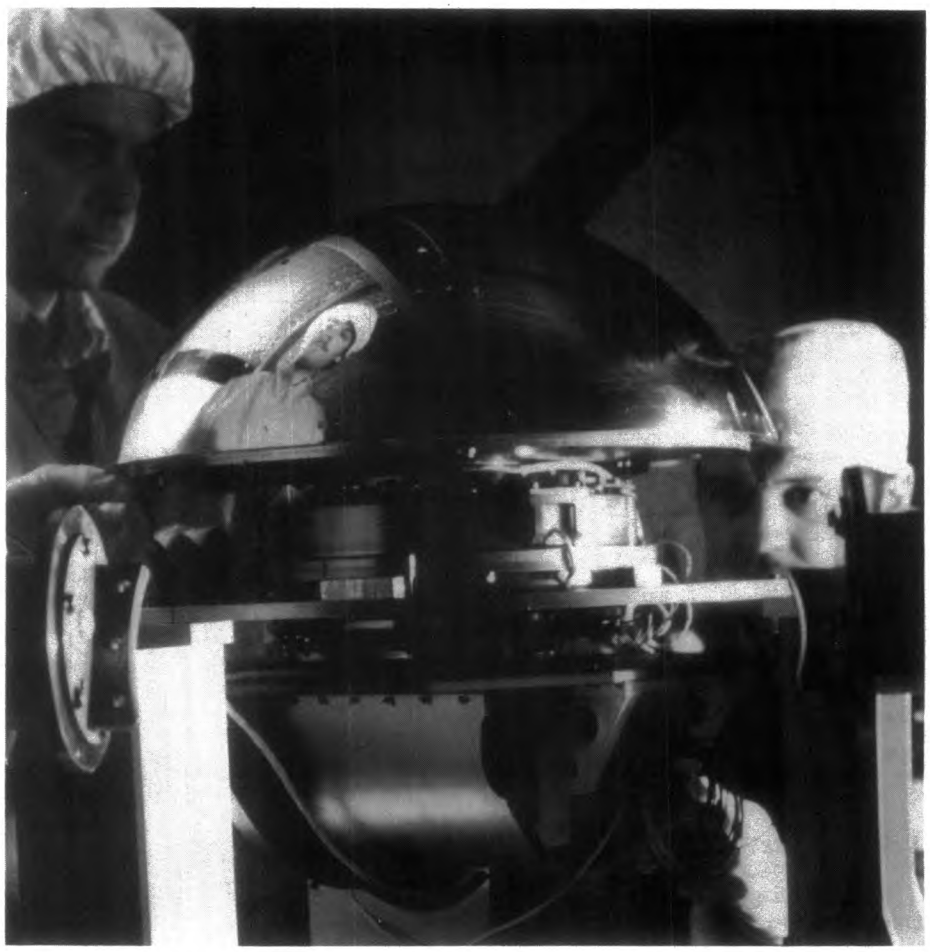
Employment of aerospace engineers is expected to grow faster than the average for all occupations through the 1980's as Federal outlays on new military aircraft, missles, and other aerospace systems increase. Aerospace engineers also will be needed to design and help produce new commercial aircraft. Much of the present fleet of airliners will have to be replaced during the 1980's with new aircraft which are quieter and more fuel-efficient. Increased demand for helicopters and business aircraft also will create opportunities for aerospace engineers. Besides job openings created by growth in demand, many aerospace engineers will be needed each year to replace those who transfer to other occupations, retire, or die.

Since a large proportion of aerospace engineering jobs are defense related, cutbacks in defense spending—like those which took place in 1969 and 1970—can result in layoffs of aerospace engineers.

## Sources of Additional Information

American Institute of Aeronautics and Astronautics, Inc., 1290 Avenue of the Americas, New York, N.Y. 10019.

(See introductory section of this chapter for discussion of training requirements and earnings.)



Aerospace engineers with spacecraft components.

# Agricultural Engineers

(D.O.T. 013.061, .151, and 090.227-010)

## Nature of the Work

Agricultural engineers design agricultural machinery and equipment and develop methods that will improve the production, processing, and distribution of food and other agricultural products. They also design systems to improve the conservation and management of energy, soil, and water resources. Agricultural engineers work in research and development, production, sales, or management.

## Employment

Most of the estimated 15,000 agricultural engineers employed in 1980 worked for manufacturers of farm equipment, electric utility companies, Federal and State soil and water management agencies, and distributors of farm equipment and supplies. Some worked as consultants to farmers and farm-related industries; others were specialists with agricultural organizations, or managers of agricultural processing plants.

About 440 agricultural engineers were employed in the Federal Government in 1980, mostly in the Department of Agriculture; some were on the faculty of colleges and universities; and a few worked in State and local governments.

Agricultural engineers design agricultural machinery and equipment.

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## Job Outlook

Employment of agricultural engineers is expected to grow faster than the average for all occupations through the 1980's. Increasing demand for agricultural products, modernization of farm operations, increasing emphasis on conservation of resources, and the use of agricultural products and wastes as industrial raw materials and energy sources should provide additional opportunities for agricultural engineers. Besides job openings created by growth in demand, many agricultural engineers will be needed to replace those who transfer to other occupations, retire, or die.

## Sources of Additional Information

American Society of Agricultural Engineers, 2950 Niles Rd., St. Joseph, Mich. 49085.

(See introductory part of this section for information on training requirements and earnings. See also statement on agricultural occupations elsewhere in the *Handbook*.)

# Biomedical Engineers

(D.O.T. 019.061-010 and 090.227-010)

## Nature of the Work

Biomedical engineers use engineering principles to solve medical and health-related problems. Many do research, along with life scientists, chemists, and members of the medical profession, on man and animals. Some design and develop medical instruments and devices, including artificial hearts and kidneys, lasers for surgery, and pacemakers that regulate the heartbeat. Other biomedical engineers adapt computers to medical science and design and build systems to modernize laboratory, hospital, and clinical procedures. Most engineers in this field have an undergraduate degree in one of the major engineering disciplines (mechanical, electrical, industrial, or chemical) and an advanced degree in some area of biomedical engineering. However, a growing number of colleges are offering undergraduate degrees in biomedical engineering, and others offer biomedical engineering as an area of specialization within a more traditional engineering specialty.

## Employment

There were an estimated 4,000 biomedical engineers in 1980. Many teach and do research in colleges and universities. Some work for the Federal Government, primarily in the National Aeronautics and Space Administration, or in State agencies. An increasing number work in private industry or in hospitals developing new devices, techniques, and systems for improving health care.

## Job Outlook

Employment of biomedical engineers is expected to grow faster than the average for all occupations through the 1980's. The actual number of openings—including replacement needs—in this small profession is not likely to be very large. Because relatively few undergraduate degrees have been granted in biomedical engineering, employment prospects of those with B.S. degrees in this field are still uncertain. Those who have advanced degrees will be in demand to teach and to fill jobs resulting from increased expenditures for medical research.

## Sources of Additional Information

Alliance for Engineering in Medicine and Biology, Suite 311, 4405 East-West Highway, Bethesda, Md. 20014.

Biomedical Engineering Society, P.O. Box 2399, Culver City, Calif. 90230.

(See introductory part of this chapter for information on training requirements and earnings.)

# Ceramic Engineers

(D.O.T. 006.061, .151, and 090.227-010)

## Nature of the Work

To most people, the word ceramics means pottery, but ceramics actually include all nonmetallic, inorganic materials which require the use of high temperature in their processing. Ceramic engineers develop new ceramic materials and methods for making ceramic materials into useful products as diverse as glassware, heat-resistant materials for furnaces, electronic components, and nuclear reactors. They also design the equipment to manufacture these products.

Ceramic engineers often specialize in one type of ceramic product—for example, products of refractories (fire- and heat-resistant materials such as firebrick); whitewares (porcelain and china dinnerware or high-voltage electrical insulators); structural materials (such as bricks and tile); electronic ceramics (the materials used in the integrated circuits that have made small calculators and computers possible); protective and refractory coatings for metals; glass; abrasives; cement; or fuel elements for atomic energy.

## Employment

An estimated 15,000 ceramic engineers were employed in 1980, mostly in the stone,

Biomedical engineers use engineering principles to solve medical problems.

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Ceramic engineers conduct research on a wide range of nonmetallic, inorganic materials.

clay, and glass industry. Others work in industries that produce or use ceramic products, such as the iron and steel, electrical equipment, aerospace, and chemicals industries. Some are in colleges and universities, independent research organizations, and the Federal Government.

### Job Outlook

Employment of ceramic engineers is expected to grow faster than the average for all occupations through the 1980's. Programs related to nuclear energy, electronics, defense, and medical science will provide job opportunities for ceramic engineers. Additional ceramic engineers will be required to improve and adapt traditional ceramic products, such as whitewares and abrasives, to new uses. The development of filters and catalytic surfaces to reduce pollution, and of ceramic materials for energy conversion and conservation, should create additional openings. Besides job openings created by growth in demand, many ceramic enginers will be needed each year to replace those who die, retire, or transfer to other occupations.

### Sources of Additional Information

National Institute of Ceramic Engineers, 65 Ceramic Dr., Columbus, Ohio 43210.

(See introductory part of this section for information on training requirements and earnings.)

## Chemical Engineers

(D.O.T. 008.061, .151, .167, and 090.227-010)

### Nature of the Work

Chemical engineers are involved in many phases of the production of chemicals and chemical products. They design equipment and plants, and determine and test methods of manufacturing the products. Chemical engineers also work in areas other than chemical manufacturing such as the design of synthetic fuel plants or the development of processes designed to prevent pollution. Because the duties of chemical engineers cut across many fields, these professionals must have a knowledge of chemistry, physics, and mechanical and electrical engineering.

This branch of engineering is so diversified and complex that chemical engineers frequently specialize in a particular operation such as oxidation or polymerization. Others specialize in a particular area such as pollution control or the production of a specific product like plastics or rubber.

### Employment

Most of the 55,000 chemical engineers working in 1980 were in manufacturing industries, primarily in the chemicals, petroleum refining, and related industries. Some worked in government agencies or taught and did research in colleges and universities. A small number worked for independent research institutes and engineering consulting firms, or as independent consultants.

### Job Outlook

Employment of chemical engineers is expected to grow about as fast as the average for all occupations through the 1980's. A major factor underlying this growth is expansion in the energy and chemical industries.

The growing complexity and automation of chemical processes will require additional chemical engineers to design, build, and maintain the necessary plants and equipment. Chemical engineers also will be needed to solve problems dealing with environmental protection, development of synthetic fuels, and the design and development of nuclear reactors. In addition, development of new chemicals used in the manufacture of consumer goods, such as plastics and synthetic fibers, probably will create additional openings. Besides job openings created by growth in demand, many chemical engineers will be needed each year to replace those who die, retire, or transfer to other occupations.

### Sources of Additional Information

American Institute of Chemical Engineers, 345 East 47th St., New York, N.Y. 10017.

American Chemical Society, 1155 16th St. NW., Washington, D.C. 20036.

(See introductory part of this section for information on training requirements and earnings.)

Chemical engineer conducting laboratory research on water quality.

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# Civil Engineers

(D.O.T. 005.061, .167, and 090.227-010)

## Nature of the Work

Civil engineers, who work in the oldest branch of the engineering profession, design and supervise the construction of roads, airports, tunnels, bridges, water supply and sewage systems, and buildings. Major specialties within civil engineering are structural, hydraulic, environmental (sanitary), transportation, highway, and soil mechanics.

Many civil engineers are in supervisory or administrative positions ranging from supervisor of a construction site to city engineer to top-level executive. Others teach in colleges and universities or work as consultants.

## Employment

About 165,000 civil engineers were employed in 1980. Most work for Federal, State, and local government agencies or in the construction industry. Many work for consulting engineering and architectural firms or as independent consulting engineers. Others work for public utilities, railroads, educational institutions, and manufacturing industries.

Civil engineers work in all parts of the country, usually in or near major industrial and commercial centers. They often work at construction sites, sometimes in remote areas or in foreign countries. In some jobs, they often move from place to place to work on different projects.

Electrical engineering is the largest engineering specialty.

## Job Outlook

Employment of civil engineers is expected to increase faster than the average for all occupations through the 1980's. A growing population and an expanding economy will result in a need for more civil engineers to design and construct manufacturing plants, electric power generating plants, and transportation systems. Construction of defense installations and synthetic fuels projects also will generate demand for civil engineers. Besides job openings created by growth in demand, many civil engineers will be needed each year to replace those who transfer to other occupations, retire, or die.

Since many civil engineers are employed in construction and related industries, employment opportunities may decrease during economic slowdowns when many new construction projects often are curtailed.

Civil engineers often visit construction sites.

## Sources of Additional Information

American Society of Civil Engineers, 345 E. 47th St., New York, N.Y. 10017.

(See introductory part of this section for information on training requirements and earnings.)

# Electrical Engineers

(D.O.T. 003.061, .151, .167, .187, and 090.227-010)

## Nature of the Work

Electrical engineers design, develop, test, and supervise the manufacture of electrical and electronic equipment. Electrical equipment includes power generating and transmission equipment used by electric utilities, electric motors, machinery controls, and

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lighting and wiring in buildings, automobiles, and aircraft. Electronic equipment includes radar, computers, communications equipment, and consumer goods such as TV sets and stereo components. Electrical engineers who work with electronic equipment often are called electronic engineers.

Electrical engineers generally specialize in a major area—such as power distributing equipment, integrated circuits, computers, electrical equipment manufacturing, or communications—or in a subdivision of these areas—microwave communication or aviation electronic systems, for example. Electrical engineers design new products, write performance requirements, and develop maintenance schedules. They also test equipment, solve operating problems, and estimate the time and cost of engineering projects. Besides manufacturing and research, development, and design, many are employed in administration and management, technical sales, or teaching.

### Employment

Electrical engineering is the largest branch of engineering. Over 325,000 electrical engineers were employed in 1980, mainly by manufacturers of electrical and electronic equipment, aircraft and parts, business machines, and professional and scientific equipment. Many worked for public utilities, government agencies, and colleges and universities. Others work for construction and engineering consulting firms. Some are independent consultants.

### Job Outlook

Employment of electrical engineers is expected to increase faster than the average for all occupations through the 1980's. Although increased demand for computers, communications equipment, and military electronics is expected to be the major contributor to this growth, demand for electrical and electronic consumer goods, along with increased research and development in new types of power generation, should create additional jobs. Besides job openings created by growth in demand, many electrical engineers will be needed each year to replace those transfer to other occupations, retire, or die.

Since many electrical engineering jobs are defense related, cutbacks in defense spending—like those which took place in 1969 and 1970—could result in layoffs of electrical engineers in defense related industries.

### Sources of Additional Information

Institute of Electrical and Electronics Engineers/ United States Activities Board, 1111 19th St. NW., Suite 608, Washington, D.C. 20036.

(See introductory part of this section for information on training requirements and earnings.)

## Industrial Engineers

(D.O.T. 012.061, .067, .167 except -066, .187, and 090.227-010)

### Nature of the Work

Industrial engineers determine the most effective ways for an organization to use the basic factors of production—people, machines, and materials. They are more concerned with people and methods of business organization than are engineers in other specialties, who generally are concerned more with products or processes, such as metals, power, or mechanics.

To solve organizational, production, and related problems most efficiently, industrial engineers design data processing systems and apply mathematical concepts (operations research techniques). They also develop management control systems to aid in financial planning and cost analysis, design production planning and control systems to coordinate activities and control product quality, and design or improve systems for the physical distribution of goods and services. Industrial engineers also conduct plant location surveys, where they look for the best combination of sources of raw materials, transportation, and taxes, and develop wage and salary administration systems and job evaluation programs. Many industrial engineers move into management positions because the work is closely related.

### Employment

About 115,000 industrial engineers were employed in 1980; more than two-thirds worked in manufacturing industries. Because their skills can be used in almost any type of company, they are more widely distributed among industries than are those in other branches of engineering. For example, they work for insurance companies, banks, construction and mining firms, public utilities, hospitals, retail organizations, and government agencies. Some teach in colleges and universities. A few are independent consultants.

### Job Outlook

Employment of industrial engineers is expected to grow faster than the average for all occupations through the 1980's. Industrial growth, more complex business operations and the greater use of automation will contribute to employment growth. Reducing costs and increasing productivity through scientific management and safety engineering should create additional opportunities. Besides job openings created by growth in demand, many industrial engineers will be needed each year to replace those who die, retire or transfer to other occupations.

### Sources of Additional Information

American Institute of Industrial Engineers, Inc., 25 Technology Park/Atlanta, Norcross, Ga. 30092.

(See introductory part of this section for information on training requirements and earnings.)

## Mechanical Engineers

(D.O.T. 007.061 except -026 and -030, .151, .161-022 and -034, .167-014; 014.061, .151, .167; and 090.227-010)

### Nature of the Work

Mechanical engineers are concerned with the use, production, and transmission of

Industrial engineers help solve production problems.

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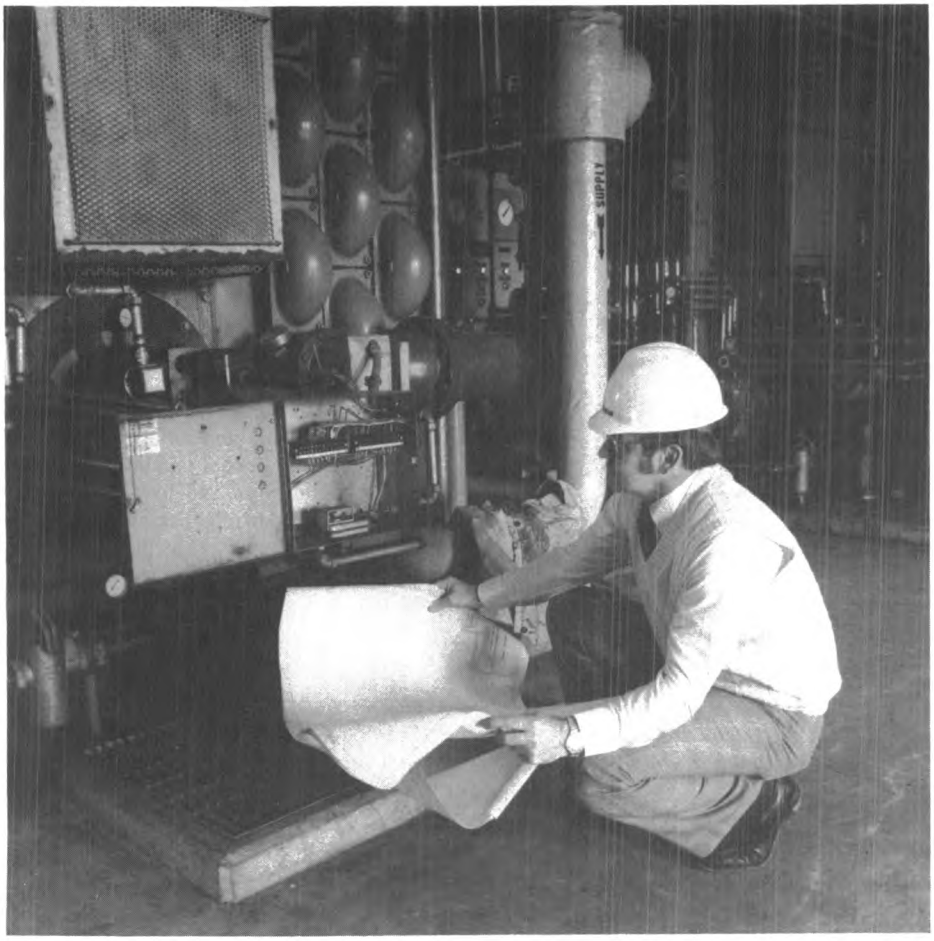

Many mechanical engineers work in maintenance and production operations.

power. They design and develop power-producing machines such as internal combustion engines, steam and gas turbines, and jet and rocket engines. They also design and develop power-using machines such as refrigeration and air-conditioning equipment, elevators, machine tools, printing presses, and steel rolling mills.

The work of mechanical engineers varies by industry and function. Many specialties have developed within the field; they include motor vehicles; marine equipment; energy conversion systems; heating, ventilating, and air-conditioning; instrumentation; and special machines for industries such as petroleum, rubber and plastics, and construction.

Large numbers of mechanical engineers do research, test, and design work while others work in maintenance, technical sales, and production operations. Many are administrators or managers. Some teach in colleges and universitites or work as consultants.

### Employment

About 213,000 mechanical engineers were employed in 1980. Almost three-fourths were employed in manufacturing—most in the primary and fabricated metals, machinery, transportation equipment, and electrical equipment industries. Others worked for government agencies, educational institutions, and consulting engineering firms.

### Job Outlook

Employment of mechanical engineers is expected to increase faster than the average for all occupations through the 1980's, the result of growing demand for machinery and machine tools and the increasing complexity of industrial machinery and processes. Mechanical engineers will be needed to develop new energy systems and to help solve environmental pollution problems. Besides job openings created by growth in demand, many mechanical engineers will be needed each year to replace those who die, retire, or transfer to other occupations.

### Sources of Additional Information

The American Society of Mechanical Engineers, 345 E. 47th St., New York, N.Y. 10017.

(See introductory part of this section for information on training requirements and earnings.)

## Metallurgical Engineers

(D.O.T. 011.061, .161.010, and 090.227-010)

### Nature of the Work

Metallurgical engineers develop new types of metal tailored to meet specific requirements—heat resistant, strong but lightweight, or highly malleable. They also develop methods to process and convert metals into useful products. Most of these engineers work in one of the three main branches of metallurgy—extractive or chemical, physical, and mechanical. Extractive metallurgists are concerned with extracting metals from ores, and refining and alloying them to obtain useful metal. Physical metallurgists deal with the nature, structure, and physical properties of metals and their alloys, and with methods of converting refined metals into final products. Mechanical metallurgists develop methods such as casting, forging, rolling, and drawing to work and shape metals. Scientists working in this field are known as metallurgists or materials scientists, but the distinction between scientists and engineers in this field is small.

### Employment

The metalworking industries—primarily the iron and steel and nonferrous metals industries—employed over one-half of the estimated 15,000 metallurgical engineers in 1980. Metallurgical engineers also work in industries that manufacture machinery, electrical equipment, and aircraft and parts, and in the mining industry. Some work for government agencies and colleges and universities.

### Job Outlook

Employment of metallurgical engineers is expected to grow faster than the average for all occupations through the 1980's. More will be needed by the metalworking industries to develop new metals and alloys as well as to adapt current ones to new applications. For example, jet engines require metals that can withstand extreme heat. As the supply of high-grade ores diminishes, more metallurgical engineers will be required to develop new ways of recycling solid waste materials and processing low-grade ores now regarded as unprofitable to mine. Metallurgical engineers also will be needed to solve problems associated with the efficient use of nuclear energy. Besides job openings created by growth in demand, many metallurgical engineers will be needed each year to replace those who die, retire, or transfer to other occupations.

### Sources of Additional Information

The Metallurgical Society of AIME, 420 Commonwealth Dr., Warrendale, Pa. 15086.

American Society for Metals, Metals Park, Ohio 44073.

(See introductory part of this section for information on training requirements and earnings.)

## Mining Engineers

(D.O.T. 010.061 except -010 and-018, .151, and 090.227-010)

### Nature of the Work

Mining engineers find, extract, and prepare minerals for manufacturing industries to

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use. They design open pit and underground mines, supervise the construction of mine shafts and tunnels in underground operations, and devise methods for transporting minerals to processing plants. Mining engineers are responsible for the safe and economical operation of mines, including ventilation, water supply, power, communications, and equipment maintenance. Some mining engineers work with geologists and metallurgical engineers to locate and appraise new ore deposits. Others develop new mining equipment or direct mineral processing operations to separate minerals from the dirt, rock, and other materials they are mixed with. Mining engineers frequently specialize in the mining of one mineral such as coal or copper.

With increased emphasis on protecting the environment, many mining engineers have been working to solve problems related to mined-land reclamation and water and air pollution.

## Employment

About 6,000 mining engineers were employed in 1980. Most work in the mining industry. Some work for firms that produce equipment for the mining industry, while others work in colleges and universities, in government agencies, or as independent consultants.

Mining engineers are usually employed at the location of mineral deposits, often near small communities. However, those in research, teaching, management, consulting, or sales often are located in metropolitan areas.

## Job Outlook

Employment of mining engineers is expected to increase faster than the average for all occupations through the 1980's. Efforts to attain energy self-sufficiency should spur the demand for coal and, therefore, for mining engineers. The increase in demand for coal will depend, to a great extent, on the availability and price of other energy sources such as petroleum, natural gas, and nuclear energy. More technologically advanced mining systems and further enforcement of mine health and safety regulations also will increase the need for mining engineers. In addition, exploration for all other minerals is also increasing. Easily mined deposits are being depleted, creating a need for engineers to devise more efficient methods for mining low-grade ores. Employment opportunities also will arise as new alloys and new uses for metals increase the demand for less widely used ores. Recovery of metals from the sea and the development of oil-shale deposits could present major challenges to the mining engineer. Besides job openings created by growth in demand, many mining engineers will be needed each year to replace those who die, retire, or transfer to other occupations.

## Sources of Additional Information

The Society of Mining Engineers of AIME, Caller Number D, Littleton, Colo. 80127.

(See introductory part of this section for information on training requirements and earnings.)

# Petroleum Engineers

(D.O.T. 010.061-018, .161-010 and -014, .167-010 and -014, and 090.227-010)

## Nature of the Work

Petroleum engineers are mainly involved in exploring and drilling for oil and gas. They work to achieve the maximum profitable recovery of oil and gas from a petroleum reservoir by determining and developing the most efficient production methods.

Since only a small proportion of the oil and gas in a reservoir will flow out under natural forces, petroleum engineers develop and use various artificial recovery methods, such as flooding the oil field with water to force the oil to the surface. The best methods in use today recover only about half the oil. Petroleum engineers' research and development in the future will be directed at finding ways to increase the proportion of oil recovered in each reservoir.

Petroleum engineers also supervise drilling operations, conduct research on drilling methods, and develop new methods of recovering offshore oil and gas. As oil and gas become harder to find, petroleum engineers must develop methods of recovery from areas that were previously considered inaccessible such as the Arctic or the ocean depths.

## Employment

About 18,000 petroleum engineers were employed in 1980, mostly in the petroleum industry and closely allied fields. Their employers include not only the major oil companies, but also the hundreds of smaller, independent oil exploration, production, and service companies. They also work for companies that produce drilling equipment and supplies. Some petroleum engineers work for banks and other financial institutions which need their knowledge of the economic value of oil and gas properties. A small number work for engineering consulting firms or as independent consulting engineers, and for Federal and State governments.

The petroleum engineer's work is concentrated in places where oil and gas are found. Almost three-fourths of all petroleum engineers are employed in Texas, Oklahoma, Louisiana, and California. There also are many American petroleum engineers working overseas in oil-producing countries.

## Job Outlook

Employment of petroleum engineers is expected to grow faster than the average for all

Metallurgical engineer testing a new metal alloy.

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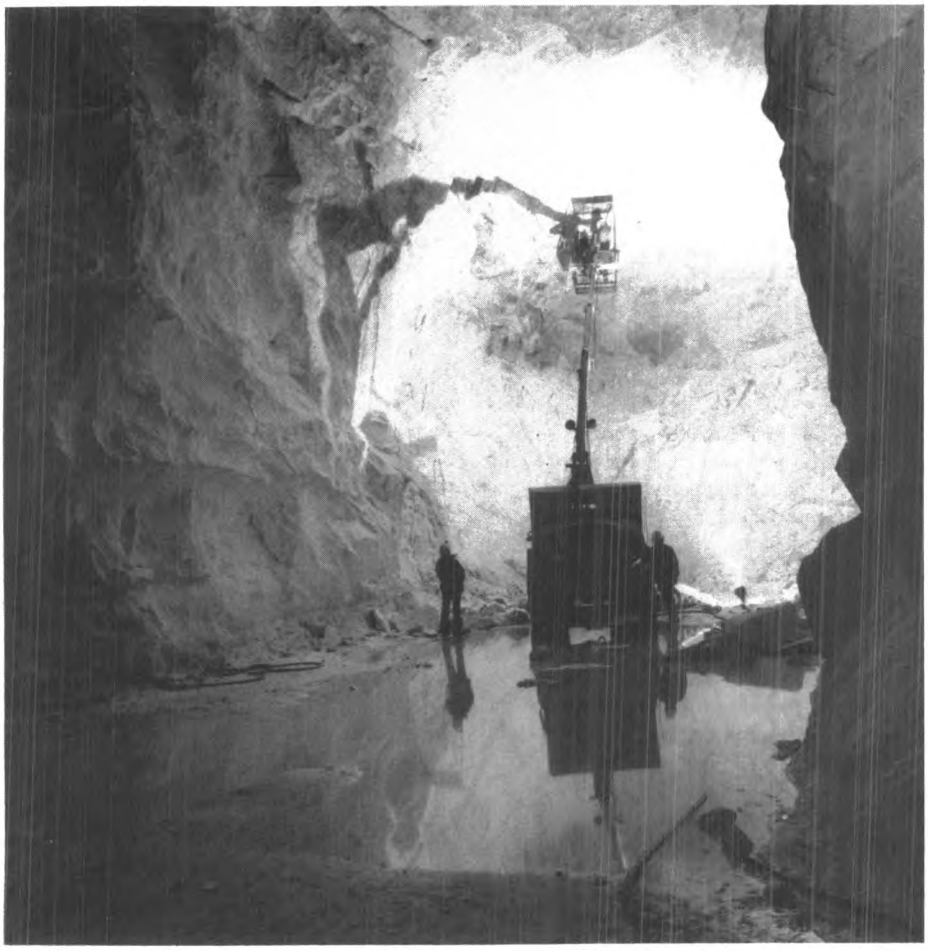

Mining engineers design mines and supervise the construction of mine shafts and tunnels.

occupations through the 1980's, as economic expansion requires increasing supplies of petroleum and natural gas, even with energy conservation measures. With efforts to attain energy self-sufficiency and with high petroleum prices, increasingly sophisticated and expensive recovery methods will be used. New sources of oil, such as oil shale and new offshore oil sources, will be developed. Also, oil and gas drilling techniques may be applied in developing geothermal energy and in recovering certain minerals. All of these factors will contribute to increasing demand for petroleum engineers. Besides job openings created by growth in demand, many petroleum engineers will be needed each year to replace those who die, retire, or transfer to other occupations.

Petroleum engineer reviewing well data.

## Sources of Additional Information

Society of Petroleum Engineers of AIME, 6200 North Central Expressway, Dallas, Tex. 75206.

(See introductory part of this section for information on training requirements and earnings.)

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# Natural Scientists and Mathematicians

## Nature of the Work

Natural scientists and mathematical scientists seek knowledge of the physical world through observation, study, and experimentation. The knowledge gained through their scientific and mathematical research activities has been used to develop new products, increase productivity, provide greater defense capabilities, protect the environment, and improve health care. Three subgroups make up this broad occupational field: Mathematical scientists and systems analysts, physical scientists, and life scientists.

Mathematical scientists and systems analysts not only study mathematics but use it as a tool to solve practical business or scientific problems. Most mathematicians do research or teach in colleges and universities. Actuaries, statisticians, and systems analysts apply mathematical techniques to practical problems in business, health care, defense, and other areas.

Physical scientists include those who do research on the nature of matter and energy both on earth and in the rest of the universe (astronomers, physicists, and chemists) and those who study how physical processes affect the earth (geologists, geophysicists, and geographers), its oceans (oceanographers), and its atmosphere (meteorologists).

Life scientists study living organisms and their life processes. The broad area of life science includes agricultural and biological scientists. Food technologists, also considered life scientists, apply the principles of life science to processing, preserving, producing, and distributing food. Foresters, range managers, and soil conservationists apply their knowledge of life science to conserving forests, rangelands, and soil.

## Training, Other Qualifications, and Advancement

For some natural science and mathematics jobs, a bachelor's degree is adequate for entry. However, in fields such as mathematics, astronomy, physics, biochemistry, or biology, an advanced degree is usually required for entry into professional level jobs.

Undergraduate training for natural scientists and mathematicians includes courses in their major field and in related scientific fields.

In graduate school, students take more advanced courses in their major area of study and in related sciences as well. Requirements for the master's or doctor's degree usually include a thesis, which is a report on the student's original research.

## Job Outlook

In the past, growth in employment of natural scientists and mathematicians has been related to an expanding economy and to increased research and development (R&D) expenditures. Both government and industry are expected to increase their R&D expenditures through the 1980's in order to expand our basic knowledge of natural science, develop new technologies and products, and to protect the natural environment. However, if the rate of economic growth and actual R&D levels and patterns differ from those assumed, the outlook in many occupations described in this section would be altered.

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# Mathematical Scientists and Systems Analysts

Mathematics is both a science and a tool used in many kinds of work. As a tool, mathematics is essential for understanding and expressing ideas in natural and social science, engineering, and business. (Occupations in these fields are discussed elsewhere in the *Handbook*.) The application of mathematical techniques in these fields has increased greatly because of the widespread use of computers, which help solve complex mathematical problems rapidly and inexpensively.

Although mathematics is used extensively in many occupations, people in the occupations covered in this section use mathematics to a higher degree than others, and often devise new mathematical techniques to solve problems. Most mathematicians teach mathematics or do research on both theoretical and applied mathematical problems.

Mathematics is applied in many areas. Statisticians use mathematical techniques to design and interpret surveys and experiments and test theories dealing with people or things. Actuaries use statistical techniques to assess the likelihood of risks that insurance companies agree to cover and to calculate the costs associated with insuring such risks. Systems analysts use mathematical, statistical, and accounting techniques to analyze and design data processing methods for business and scientific research projects.

Most jobs related to mathematics require at least a bachelor's degree in mathematics, statistics, or a related field. A graduate degree is helpful but not necessary for employment as a statistician, actuary, or systems analyst. The majority of mathematicians have a Ph.D.

## Actuaries

(D.O.T. 020.167-010)

### Nature of the Work

Why do young persons pay more for automobile insurance than older persons? How much should an insurance policy cost? How much should an organization contribute each year to its pension fund? Answers to these and similar questions are provided by actuaries who design insurance and pension plans and follow their experience to make sure that they are maintained on a sound financial basis. Actuaries assemble and analyze statistics to calculate probabilities of death, sickness, injury, disability, unemployment, retirement, and property loss from accident, theft, fire, and other hazards. They use this information to determine the expected insured loss. For example, they may calculate how many persons who are 21 years old today can be expected to die before age 65—the probability that an insured person might die during this period is a risk to the company. They then calculate a price for assuming this risk that will be profitable to the company yet be competitive with other insurance companies. Finally, they must make sure that the price charged for the insurance will enable the company to pay all claims and expenses as they occur. In a similar manner, the actuary calculates premium rates and determines policy contract provisions for each type of insurance offered. Most actuaries specialize in either life and health insurance or property and liability (casualty) insurance; a growing number specialize in pension plans.

To perform their duties effectively, actuaries must keep informed about general economic and social trends, and legislative, health, and other developments that may affect insurance practices. Because of their broad knowledge of insurance, company actuaries may work in investment, group underwriting, or pension planning departments. Actuaries in executive positions help determine company policy. In that role, they may be called upon to explain complex technical matters to company executives, government officials, policyholders, and the public. They may testify before public agencies on proposed legislation affecting the insurance business, for example, or explain intended changes in premium rates or contract provisions.

Actuaries who work for the Federal Government usually deal with a particular insurance or pension program, such as social security or life insurance for veterans and members of the Armed Forces. Actuaries in State government regulate insurance companies, supervise the operations of State retirement or pension systems, and work on unemployment insurance or workers' compensation problems. Consulting actuaries set up pension and welfare plans for private companies, unions, and government agencies. They calculate future benefits and determine the amount of employer contribution. Actuaries who are enrolled under the provisions of the Employee Retirement Income Security Act of 1974 (ERISA) evaluate these pension plans and report on their financial soundness.

### Working Conditions

Actuaries have desk jobs that require no unusual physical activity; their offices generally are comfortable and pleasant.

Actuaries generally work between 35 and 40 hours a week, except during busy periods when overtime may be required. Actuaries may travel to branch offices of their company or to clients.

### Employment

Approximately 8,000 persons worked as actuaries in 1980. Many worked in insurance company headquarters in New York, Hartford, Chicago, Philadelphia, or Boston.

More than half of all actuaries worked for private insurance companies. Most of these worked for life insurance companies; the rest worked for property and liability (casualty) companies. The number of actuaries employed by an insurance company depends on its volume of business and the types of insurance policies it offers. Large companies may employ over 100 actuaries; others, generally smaller companies, may rely instead on consulting firms, accounting firms, or rating bureaus (associations that supply actuarial data to member companies).

Employment of actuaries has been growing in consulting firms, rating bureaus, and accounting firms. Other actuaries work for private organizations administering independent pension and welfare plans or for Federal and State government agencies. A few teach in colleges and universities.

### Training, Other Qualifications, and Advancement

A good educational background for a beginning job in a large life or casualty company is a bachelor's degree with a major in mathematics or statistics; a degree in actuarial science is even better. Some companies hire applicants with a major in engineering, economics, or business administration, provided they have a working knowledge of mathematics, including calculus, probability, and statistics (20-25 hours). Courses in accounting, computer science, economics, and insurance also are useful. Although only 32 colleges and universities offer a degree in actuarial science, several hundred schools offer a degree in mathematics or statistics.

A strong background in mathematics is essential for persons interested in a career as an actuary. It is an advantage to pass, while still in school, one or more of the examinations offered by professional actuarial societies. Three societies sponsor programs leading to full professional status in their specialty. The Society of Actuaries gives ten actuarial examinations for the life and health insurance and pension field, the Casualty Actuarial Society gives ten examinations for the property and liability field, and the American Society of Pension Actuaries gives nine examinations covering the pension field. Because the first parts of the examination series of each society cover similar materials, students need not commit themselves to a specialty until they have taken four examinations. The first three test competence in subjects such as linear algebra, numerical


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methods, operations research, probability, calculus, and statistics; the fourth covers concepts of actuarial science such as theories of compound interest, mortality tables, and risk. These first few examinations help students evaluate their potential as actuaries, and those who pass usually have better opportunities for employment and higher starting salaries.

Actuaries are encouraged to complete the entire series of examinations as soon as possible; completion generally takes from 5 to 10 years. Examinations are given twice each year. Extensive home study is required to pass the advanced examinations; many actuaries study 20-25 hours a week. Actuaries who complete five examinations in either the life insurance series or the pension series or seven examinations in the casualty series are awarded "associate" membership in their society. Those who pass an entire series receive full membership and the title "fellow."

Consulting pension actuaries who service private pension plans and certify their solvency must be enrolled by the Joint Board for the Enrollment of Actuaries, a U.S. government agency. Applicants for enrollment must meet certain experience and education requirements as stipulated by the Joint Board.

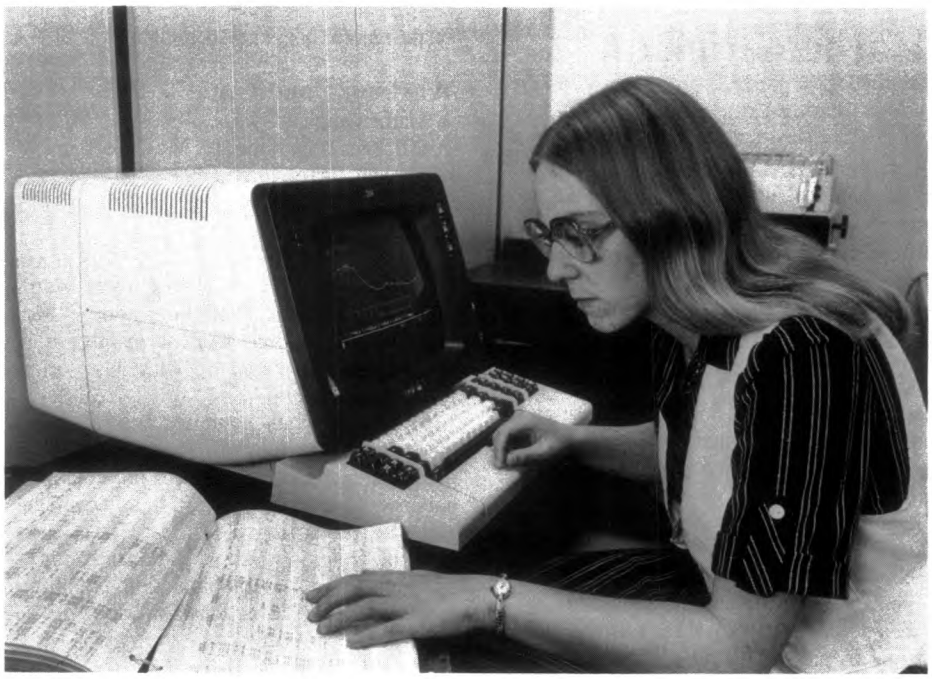
Beginning actuaries often rotate among jobs to learn various actuarial operations and different phases of insurance work. At first, they prepare tabulations for actuarial tables or perform other simple tasks. As they gain experience, they may supervise clerks, prepare correspondence and reports, and do research.

Advancement to more responsible work as assistant, associate, and chief actuary depends largely on job performance and the number of actuarial examinations passed. Many actuaries, because of their broad knowledge of insurance and related fields, are selected for administrative positions in underwriting, accounting, or data processing departments. Many advance to top executive positions.

## Job Outlook

Employment of actuaries is expected to grow faster than the average for all occupations through the 1980's. In addition to job openings resulting from growth in demand for actuaries, additional openings will arise each year as individuals retire, die, or transfer to other occupations. Job opportunities will be best for new college graduates who have passed at least two actuarial examinations while still in school and have a strong mathematical and statistical background.

Employment in this occupation is influenced by the volume of insurance sales, which is expected to grow over the next decade. Shifts in the age distribution of the population will result in a large increase in the number of people with established careers and family responsibilities. This is the group that traditionally has accounted for the bulk of private insurance sales.



Actuary analyzes statistical data.

In addition, changing insurance practices will create a need for more actuarial services. For example, as insurance companies branch out into more than one kind of insurance coverage, more actuaries will be needed to establish rates. Growth in new forms of protection, such as dental, prepaid legal, and kidnap insurance also will stimulate demand. As people live longer, they draw health and pension benefits for a longer period, and actuaries will need to recalculate the probabilities of such factors as death, sickness, and length of retirement. As more States pass competitive rating laws, many companies that previously relied on rating bureaus for actuarial data can be expected to create actuarial departments.

The liability of companies for damage resulting from their products has received much attention as a result of recent court decisions. In the years ahead, actuaries will be more involved in the development of product liability insurance, as well as medical malpractice, workers' compensation coverage, and pollution liability insurance.

Insurance coverage is considered a necessity by most individuals and businesses, regardless of economic conditions. Therefore, actuaries are unlikely to be laid off during a recession.

## Earnings

In 1980, new college graduates entering the life insurance field without having passed any actuarial exams averaged about $13,000, according to a survey by the Life Office Management Association (LOMA). Beginners who had completed the first exam received between $14,000 and $17,000, and those who had passed the second exam averaged between $15,000 and $18,000, depending on geographic location.

Life insurance companies give merit increases to actuaries as they gain experience and pass examinations. Actuaries who became associates in 1980, earned average salaries between $21,000 and $24,500 a year; actuaries who became fellows during that year received average salaries between $30,000 and $35,000. Fellows with additional years of experience earned substantially more—top actuarial executives received average salaries of about $52,000 a year. Although data are not available for those in casualty companies or consulting firms, it is believed that their salaries are comparable to those of life insurance actuaries.

## Related Occupations

Actuaries assemble and analyze statistics in their day-to-day work. Other workers whose jobs involve similar skills include mathematicians, statisticians, economists, financial analysts, and engineering analysts.

## Sources of Additional Information

For facts about actuarial opportunities and qualifications, contact:

American Society of Pension Actuaries, 1700 K St. NW., Washington, D.C. 20006.

Casualty Actuarial Society, One Penn Plaza, 250 West 34 St., New York, N.Y. 10119.

Society of Actuaries, 208 South LaSalle St., Chicago, Ill. 60604.

American Academy of Actuaries, 1835 K St. NW., Suite 515, Washington, D.C. 20006.

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# Mathematicians

(D.O.T. 020.067-014, -022 and 090.227-010)

## Nature of the Work

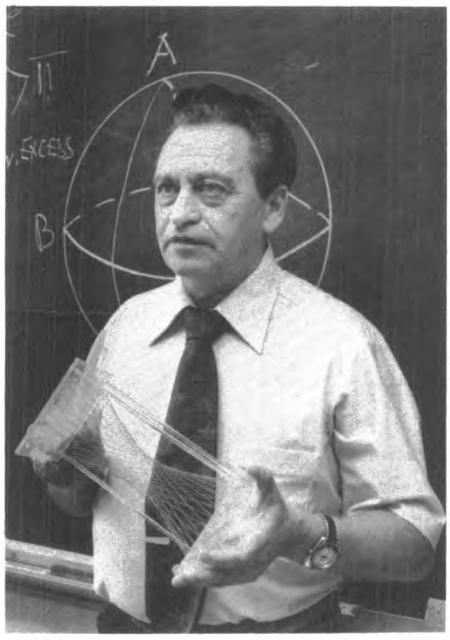
Mathematicians work in one of the oldest and most basic sciences. Mathematicians today are engaged in a wide variety of activities, ranging from the creation of new theories to the translation of scientific and managerial problems into mathematical terms.

Mathematical work falls into two broad classes: theoretical (pure) mathematics; and applied mathematics. However, these classes are not sharply defined and often overlap.

Theoretical mathematicians advance mathematical science by developing new principles and new relationships between existing principles of mathematics. Although they seek to increase basic knowledge without necessarily considering its practical use, this pure and abstract knowledge has been instrumental in producing many scientific and engineering achievements. For example, in 1854 Bernard Riemann invented a seemingly impractical non-Euclidian geometry that was to become part of Albert Einstein's theory of relativity. Years later, this theory contributed to the creation of atomic power.

Applied mathematicians use mathematics to develop theories, techniques, and approaches to solve practical problems in business, government, engineering, and the natural and social sciences. Their work ranges from analysis of the mathematical aspects of launching communications satellites to studies of the effects of new drugs on disease.

Much work in applied mathematics, however, is carried on by persons other than mathematicians. In fact, the number of workers who depend upon mathematical expertise is many times greater than the number actually designated as mathematicians.



Three out of four mathematicians work in colleges and universities.

## Working Conditions

Mathematicians work almost exclusively in offices and classrooms. Most work regular hours and travel infrequently.

## Employment

About 40,000 persons worked as mathematicians in 1980. Almost three-fourths worked in colleges and universities. Most were teachers; some worked mainly in research and development with few or no teaching duties.

Most other mathematicians worked in private industry and government. In private industry, major employers were the communications, chemical, aircraft, and computer and data processing industries. The Department of Defense and the National Aeronautics and Space Administration employed most of the mathematicians working in the Federal Government.

Mathematicians work in all States, but are concentrated in those with high-technology industries and large college and university enrollments.

## Training, Other Qualifications, and Advancement

An advanced degree is the basic requirement for beginning teaching jobs, as well as for most research positions. In most four-year colleges and universities, the Ph.D. degree is necessary for full faculty status. A master's degree is adequate preparation for teaching jobs in most two-year colleges and technical institutes.

Although the bachelor's degree may be adequate preparation for some jobs in private industry and government, employers usually require an advanced degree. Those bachelor's degree holders who find jobs as mathematicians usually assist senior mathematicians by performing computations and solving less advanced problems in applied mathematics. However, advancement often depends on achieving an advanced degree. Other bachelor's degree holders work as research or teaching assistants in colleges and universities while studying for an advanced degree. The majority of bachelor's degree holders work in related fields such as computer science.

The bachelor's degree in mathematics is offered by most colleges and universities. Mathematics courses usually required for a degree are analytical geometry, calculus, differential equations, probability theory and statistics, mathematical analysis, and modern algebra. Many colleges and universities urge or even require students majoring in mathematics to take several courses in a field that uses or is closely related to mathematics, such as computer science, operations research, a physical science, or economics. A prospective college mathematics student should take as many mathematics courses as possible while in high school.

More than 400 colleges and universities offer the master's degree in mathematics; about 150 also offer the Ph.D. In graduate school, students conduct research and take advanced courses, usually in a specific field of mathematics such as algebra, mathematical analysis, or geometry.

For work in applied mathematics, training in the field in which the mathematics will be used is very important. Fields in which applied mathematics is used extensively include physics, engineering, and operations research; of increasing importance are business and industrial management, economics, statistics, chemistry and life sciences, and the behavioral sciences.

Mathematicians should have a good knowledge of computer programming since most complex mathematical computation is done by computer.

Mathematicians need good reasoning ability, persistence, and the ability to apply basic principles to new types of problems. They must be able to communicate well since they often need to discuss the problem to be solved with nonmathematicians.

## Job Outlook

Employment of mathematicians is expected to increase more slowly than the average for all occupations through the 1980's because the majority of mathematicians work in colleges and universities, where little employment growth is expected. Those with Ph.D. degrees in mathematics should have favorable employment opportunities. However, most job openings for Ph.D.'s will either be in industry or in college faculty positions at the undergraduate level. There will be competition for jobs involving theoretical research or for research oriented university faculty positions.

Holders of Ph.D. degrees in applied mathematics should have better employment prospects than those whose interest and training are confined to the theoretical aspects of mathematics. Although some opportunities may be available to theoretical mathematicians in nonacademic areas, most nonacademic employers will seek applied mathematicians who can solve practical problems. Private industry and government agencies will need applied mathematicians for work in operations research, numerical analysis, computer systems programming, applied mathematical physics, market research, and commercial surveys, and as consultants in industrial laboratories.

Those with only a bachelor's or master's degree in mathematics may have difficulty finding a job as a mathematician because most jobs in teaching or research require a Ph.D., although there will be some openings in applied areas and in two-year college teaching. However, a mathematics degree makes one well qualified to enter related occupations such as statistician, actuary, computer programmer, systems analyst, economist, engineer, and physical or life sci-

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entist. Employment opportunities in these fields will probably be best for those who combine a major in mathematics with a minor in one of these subjects.

Graduates with State teaching certificates may also find openings as high school mathematics teachers. (See statement on secondary school teachers elsewhere in the *Handbook*.)

## Earnings

Starting salaries for mathematicians with a bachelor's degree averaged about $17,700 a year. Those with a master's degree started at about $20,200 annually. Salaries for new graduates having the Ph.D., most of whom had some experience, averaged over $26,400.

In the Federal Government in 1980, mathematicians having the bachelor's degree and no experience could start at either $12,266 or $15,193 a year, depending on their college records. Those with the master's degree could start at $18,585 or $22,486; and persons having the Ph.D. degree could begin at either $22,486 or $26,951. The average salary for all mathematicians in the Federal Government was about $30,100 in 1980.

Salaries paid to college and university mathematics teachers are comparable to those for other faculty members. (See statement on college and university teachers elsewhere in the *Handbook*.)

## Related Occupations

The work of actuaries, statisticians, computer programmers, systems analysts, and operations research analysts is closely related to mathematics. In addition, workers in many fields such as natural and social science, engineering, and finance use mathematics extensively.

## Sources of Additional Information

Several brochures are available that give facts about the field of mathematics, including career opportunities, professional training, and colleges and universities with degree programs.

*Seeking Employment in the Mathematical Sciences* is available for 50 cents from:

American Mathematical Society, P.O. Box 6248, Providence, R.I. 02940.

*Professional Opportunities in Mathematics* is available for $1.50 from:

Mathematical Association of America, 1529 18th St. NW., Washington, D.C. 20036.

For specific information on careers in applied mathematics, contact:

Society for Industrial and Applied Mathematics, 1405 Architects Building, 117 S. 17th St., Philadelphia, Pa. 19103.

# Statisticians

(D.O.T. 020.067-026, and 090.227-010)

## Nature of the Work

Statistics are numbers that help describe the characteristics of the world and its inhabitants. Statisticians devise, carry out, and interpret the numerical results of surveys and experiments. In doing so, they apply their knowledge of statistical methods to a particular subject area, such as economics, human behavior, natural science, or engineering. They may use statistical techniques to predict population growth or economic conditions, develop quality control tests for manufactured products, or help business managers and government officials make decisions and evaluate the results of new programs.

Statisticians devise surveys and experiments and interpret the results.

Often statisticians are able to obtain accurate information about a group of people or things by surveying a small portion, called a sample, rather than the whole group. For example, television rating services ask only a few thousand families, rather than all viewers, what programs they watch to determine the size of the total audience. Statisticians decide where and how to get the data, determine the type and size of the sample group, and develop the survey questionnaire or reporting form. They also prepare instructions for workers who will tabulate the returns.

Since statistics are used in so many areas, it sometimes is difficult to distinguish statisticians from specialists in other fields who use statistics. For example, a statistician working with data on economic conditions may have the title of economist.

## Working Conditions

Statisticians usually work regular hours in offices. Some statisticians may travel occasionally to supervise or set up a survey, or to gather statistical data. Some spend all day doing fairly repetitive tasks, while others may be involved in a variety of tasks such as designing surveys or interpreting data.

## Employment

Approximately 26,500 persons worked as statisticians in 1980. Over half were in private industry, primarily in manufacturing, finance, and insurance companies. About one-third worked for Federal, State, or local government. Federally employed statisticians are concentrated in the Departments of Commerce, Health and Human Services, Agriculture, and Defense. Others worked in colleges and universities and nonprofit organizations.

Although statisticians work in all parts of the country, most are in metropolitan areas, and about one-fourth work in three areas—New York City; Washington, D.C.; and Los Angeles-Long Beach, Calif.

## Training, Other Qualifications, and Advancement

A bachelor's degree with a major in statistics or mathematics is the minimum educational requirement for many beginning jobs in statistics. For other entry level statistical jobs, however, a bachelor's degree with a major in an applied field such as economics or natural science and a minor in statistics is preferable. A graduate degree in mathematics or statistics is essential for college and university teaching.

Over 200 colleges and universities offered statistics as a concentration for a bachelor's degree in 1980. Many schools also offer either a degree in mathematics or a sufficient number of courses in statistics to qualify graduates for beginning positions. Required subjects for statistics majors include mathematics through differential and integral calculus, statistical methods, and probability theory. Courses in computer uses and techniques, if not required, are highly recommended. For quality-control positions, training in engineering or physical or biologi-

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cal science is desirable. For many market research, business analysis, and forecasting jobs, courses in economics and business administration are helpful.

Many colleges and universities also offered graduate degrees in statistics in 1980, and many other schools offered one or two graduate level statistics courses. Acceptance into graduate programs does not require an undergraduate degree in statistics although a good mathematics background is essential.

Beginning statisticians who have only the bachelor's degree often spend much of their time performing routine work under the supervision of an experienced statistician. Through experience, they may advance to positions of greater technical and supervisory responsibility. However, opportunities for promotion are best for those with advanced degrees.

## Job Outlook

Employment opportunities for persons who combine training in statistics with knowledge of a field of application are expected to be favorable through the 1980's. Besides the average growth expected in this field, additional statisticians will be needed to replace those who die, retire, or transfer to other occupations.

Private industry will require increasing numbers of statisticians for quality control in manufacturing. Statisticians with knowledge of engineering and the physicial sciences will find jobs working with scientists and engineers in research and development. Business firms will rely more heavily than in the past on statisticians to forecast sales, analyze business conditions, modernize accounting procedures, and help solve management problems.

Many fields such as law and history have recognized the usefulness of statistics, and statistical techniques are being used increasingly to determine such things as the effects of pollution and toxic substances. As the use of statistics expands into new areas, more statisticians will be needed.

Federal, State, and local government agencies will need statisticians for existing and new programs in fields such as transportation, social security, health, and education. The broader use of statistical methods is also likely to result in a need for more teachers of statistics in colleges and universities

## Earnings

In the Federal Government in 1980, statisticians who had the bachelor's degree and no experience could start at either $12,266 or $15,193 a year, depending on their college grades. Beginning statisticians with the master's degree could start at $18,585 or $22,486. Those with the Ph.D. could begin at $22,486 or $26,951. The average annual salary for statisticians in the Federal Government was about $29,300 in 1980.

Salaries in private industry were comparable to those in the Federal Government, according to the limited data available.

Statisticians employed by colleges and universities generally receive salaries comparable to those paid other faculty members. (See the statement on college and university teachers elsewhere in the *Handbook*.) In addition to their regular salaries, many statisticians in educational institutions earn extra income from outside research projects, consulting, and writing.

## Related Occupations

Workers in the following occupations use statistics to such an extent their job is often similar to that of a statistician: Marketing research workers, urban and regional planners, engineers, environmental scientists, life scientists, physical scientists, and social scientists. Others who work with numbers are actuaries, mathematicians, financial analysts, computer programmers, and systems analysts.

## Sources of Additional Information

For information about career opportunities in statistics, contact:

American Statistical Association, 806 15th St. NW., Washington, D.C. 20005.

Information on Federal job opportunities is available from area offices of the State employment service and the U.S. Office of Personnel Management or from Federal Job Information Centers located in various large cities throughout the country.

For information on a career as a mathematical statistician, contact:

Dr. Martin Fox, Institute of Mathematical Statistics, Department of Statistics and Probability, Michigan State University, East Lansing, Mich. 48824.

# Systems Analysts

(D.O.T. 003.167-062; 012.167-066; 020.062-010 and 067.010; and 109.067-010)

## Nature of the Work

Many essential business functions and scientific research projects depend on systems analysts to plan efficient methods of processing data and handling the results. Analysts begin an assignment by discussing the data processing problem with managers or specialists to determine the exact nature of the problem and to break it down into its component parts. If a new inventory system is desired, for example, systems analysts must determine what new data must be collected, the equipment needed for computation, and the steps to be followed in processing the information.

Analysts use various techniques, such as cost accounting, sampling, and mathematical model building to analyze a problem and devise a new system. Once a system has been developed, they prepare charts and diagrams that describe its operation in terms that managers or customers can understand. They also may prepare a cost-benefit analysis to help the client decide whether the proposed system is satisfactory.

If the system is accepted, systems analysts translate the logical requirements of the system into the capabilities of the computer machinery or "hardware." They also prepare specifications for programmers to follow and work with them to "debug," or eliminate errors from the system. (The work of computer programmers is described elsewhere in the *Handbook*.)

The problems that systems analysts solve range from monitoring nuclear fission in a powerplant to forecasting sales for an appliance manufacturing firm. Because the work is so varied and complex, analysts usually specialize in either business or scientific and engineering applications.

Some analysts improve systems already in use by developing better procedures or adapting the system to handle additional types of data. Others do research, called advanced systems design, to devise new methods of systems analysis.

## Working Conditions

Systems analysts usually work about 40 hours a week—the same as other professional and office workers. Unlike many computer operators, systems analysts are not assigned to evening or night shifts. Occasionally, however, evening or weekend work may be necessary to complete emergency projects.

## Employment

About 205,000 persons worked as systems analysts in 1980. Employment of these workers is concentrated in two geographic regions—about one-third of the total are employed in the Midwest and one-fourth work in the northeastern portion of the United States. Most systems analysts worked in urban areas for manufacturing firms, government agencies, wholesale businesses, and data processing service organizations. In addition, large numbers worked for banks and insurance companies.

## Training, Other Qualifications, and Advancement

There is no universally acceptable way of preparing for a job as a systems analyst because employers' preferences depend on the work being done. However, college graduates generally are sought for these jobs, and, for some of the more complex jobs, persons with graduate degrees are preferred. Employers usually want analysts with a background in accounting, business management, or economics for work in a business environment while a background in the physical sciences, mathematics, or engineering is preferred for work in scientifically oriented organizations. A growing number of employers seek applicants who have a degree in computer science, information science, information

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systems, or data processing. Regardless of college major, employers look for people who are familiar with programming languages. Courses in computer concepts, systems analysis, and data base management systems offer good preparation for a job in this field.

Prior work experience is important. Nearly half of all persons entering this occupation have transferred from other occupations, especially from computer programmer. In many industries, systems analysts begin as programmers and are promoted to analyst positions after gaining experience.

Systems analysts must be able to think logically and should like working with ideas. They often deal with a number of tasks simultaneously. The ability to concentrate and pay close attention to detail also is important. Although systems analysts often work independently, they also work in teams on large projects. They must be able to communicate effectively with technical personnel, such as programmers, as well as with clients who have no computer background.

In order to advance, systems analysts must continue their technical education. Technological advances come so rapidly in the computer field that continuous study is necessary to keep skills up to date. Training usually takes the form of 1- and 2-week courses offered by employers and "software" vendors. Additional training may come from professional development seminars offered by professional computing societies.

An indication of experience and professional competence is the Certificate in Data Processing (CDP). This designation is conferred by the Institute for Certification of Computer Professionals upon candidates who have completed 5 years' experience and passed a five-part examination.

In large data processing departments, persons who begin as junior systems analysts may be promoted to senior or lead systems analysts after several years of experience. Systems analysts who show leadership ability also can advance to jobs as managers of systems analysis or data processing departments.

The shortage of trained computer personnel has resulted in an upward pay spiral that is expected to continue.

## Job Outlook

Employment of systems analysts is expected to grow much faster than the average for all occupations through the 1980's as computer usage expands, particularly in computer service firms, accounting firms, and organizations engaged in research and development. Many systems analysts also will be needed by computer manufacturers to design software packages. In addition to jobs that will be created by increased computer usage, some openings will occur as systems analysts advance to managerial positions, become consultants, or enter other occupations. Because many of these workers are relatively young, few positions will result from retirement or death.

The demand for systems analysts is expected to rise as computer capabilities are increased and as new applications are found for computer technology. Sophisticated accounting systems, telecommunications networks, and scientific research are just a few areas where use of computer systems has resulted in new approaches to problem solving. Over the next decade, systems analysts also will be developing ways to use the computer's resources to solve problems in areas that have not yet been recognized.

Advances in technology that have drastically reduced the size and cost of computer hardware will have differing effects on employment of systems analysts. Employment in data processing firms may not grow quite as rapidly as in recent years as more small businesses install their own computers rather than rely on a data processing service. This will be offset, however, by a rising demand for analysts to design systems for small computers that are specifically adapted to meet problem-solving needs of small firms.

Graduates of computer-related curriculums should enjoy the best prospects for employment. College graduates who have had courses in computer programming, systems analysis, and other data processing areas should also find many opportunities. Persons without a college degree and college graduates unfamiliar with data processing will face competition from the large number of experienced workers seeking jobs as systems analysts.

## Earnings

Earnings for beginning systems analysts in private industry averaged about $330 a week in 1980, according to surveys conducted in

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urban areas by the Bureau of Labor Statistics and private firms engaged in research on computer occupations. Experienced workers earned from $390 to $460, and lead systems analysts earned about $490 weekly. Overall, systems analysts earn well over twice as much as the average for all nonsupervisory workers in private industry, except farming. In the Federal Government, the entrance salary for recent college graduates with a bachelor's degree was about $200 a week in early 1981.

Systems analysts working in the North and West earned somewhat more than those in the South, and generally their earnings were greater in data processing service firms or in heavy manufacturing than in insurance companies or educational institutions.

## Related Occupations

Other workers in mathematics, business, and science who use logic and reasoning ability to solve problems are programmers, financial analysts, urban planners, engineers, mathematicians, operations research analysts, and actuaries.

## Sources of Additional Information

Further information about the occupation of systems analyst is available from:

American Federation of Information Processing Societies, 1815 North Lynn St., Arlington, Va. 22209.

Association for Systems Management, 24587 Bagley Rd., Cleveland, Ohio 44138.

Information about the Certificate in Data Processing is available from:

The Institute for Certification of Computer Professionals, 35 E. Wacker Dr., Suite 2828, Chicago, Ill. 60601.

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# Physical Scientists

Physical scientists investigate the structure and composition of the earth and the universe. Many physical scientists perform research designed to increase basic scientific knowledge. Others employ the results of research to solve practical problems in developing new products, locating new sources of oil, or predicting the weather. Many physical scientists work in colleges and universities; others, especially chemists, geologists, and geophysicists, work in private industry.

This section covers eight physical science occupations—astronomers, chemists, geographers, geologists, geophysicists, meteorologists, oceanographers, and physicists. Most astronomers, oceanographers, and physicists have Ph.D.'s. The jobs of many other physical scientists also require a Ph.D., especially those who are employed in colleges and universities, but some jobs in these other fields can be entered with a bachelor's degree.

A knowledge of the physical sciences (especially chemistry and physics) is also required by engineers and life scientists; these occupations are discussed elsewhere in the *Handbook*.

## Astronomers

(D.O.T. 021.067-010 and 090.227-010)

### Nature of the Work

Astronomers seek answers to questions about the fundamental nature of the universe, such as its origin and history and the evolution of our solar system. Astronomers—sometimes called *astrophysicists*—use the principles of physics and mathematics to study and determine the behavior of matter and energy in distant galaxies. One application of the information they gain is to prove or disprove theories of the nature of matter and energy such as Einstein's theory of relativity.

To make observations of the universe, astronomers use large telescopes, radiotelescopes, and other instruments (some in orbiting satellites) that can detect electromagnetic radiation from distant sources. By using spectroscopes to analyze light from stars, astronomers can determine their chemical composition. They use computers to analyze data and solve complex mathematical equations that are developed to represent various theories. Computers also are useful for processing astronomical data to calculate orbits of asteroids or comets, guide spacecraft, and work out tables for navigational handbooks.

Contrary to the popular image, astronomers almost never actually look through a telescope, because photographic and electronic light-detecting equipment is more effective than the human eye. Also, much astronomical information is collected by radio telescopes and other electronic means which detect invisible radio waves, X-rays, and cosmic waves.

Most astronomers spend only a few weeks each year making observations. They spend the rest of their time analyzing the large quantities of data collected by their own and others' observations and writing scientific papers on the results of their research. Some astronomers concentrate on theoretical problems and seldom visit observatories. They formulate theories or mathematical models to explain observations made earlier by other astronomers.

Almost all astronomers do research or teach; those in colleges and universities often do both. In schools that do not have separate departments of astronomy or only small enrollments in the subject, they often teach courses in mathematics or physics as well as astronomy. Some astronomers administer research programs, develop and design astronomical instruments, and do consulting work.

### Working Conditions

Most astronomers spend much of their time working in offices or classrooms, although astronomers who make observations may need to travel to the observing facility and frequently work at night. Astronomers are often under considerable pressure to produce research results which are of publishable quality. In some universities, relatively new astronomers who do not produce significant research results are not granted tenure, which is in effect a permanent position. Those not granted tenure face the possibility of losing their jobs.

### Employment

Astronomy is the smallest physical science; about 3,000 persons worked as astronomers in 1980. Over half of all astronomers work in colleges and universities. Most of the rest work in observatories operated by universities, nonprofit organizations, and the Federal Government.

The Federal Government employed about 550 astronomers and space scientists in 1980. Most worked for the National Aeronautics and Space Administration. Others worked for the Department of Defense, mainly at the U.S. Naval Observatory and the U.S. Naval Research Laboratory. A few astronomers worked for aerospace firms or in museums and planetariums.

### Training, Other Qualifications, and Advancement

The usual requirement for a job in astronomy is a Ph.D. degree. Persons with less education may qualify for some jobs assisting astronomers.

Astronomer prepares to make an observation by adjusting a spectrograph.

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About 50 universities offer the Ph.D. degree in astronomy. These programs include advanced courses in astronomy, physics, and mathematics. Some schools require that graduate students spend several months working at an observatory. In most institutions, the program leading to the doctorate is flexible and allows students to take courses in their own area of interest. The usual qualification for entrance to a graduate program in astronomy is a bachelor's degree in astronomy, physics, or mathematics with a physics minor.

Persons planning careers in astronomy should have great interest and ability in science and mathematics, as well as imagination and an inquisitive mind. Perseverance and the ability to concentrate on detail and to work independently also are important.

New graduates with a doctorate may work for several years on a postdoctoral fellowship, which provides employment while they gain further research experience and look for a permanent position. Other new Ph.D.'s, however, enter teaching or research jobs immediately after attaining their degree.

## Job Outlook

Persons seeking positions as astronomers will face keen competition for the few available openings expected through the 1980's. Employment of astronomers is expected to grow slowly, if at all, because funds for basic research in astronomy, which come mainly from the Federal Government, are not expected to increase enough to create many new positions. Furthermore, enrollments in astronomy and physics are not expected to grow, so there will be little need for additional teaching faculty. Most openings will occur as replacements for those who die or retire. Since astronomy is such a small profession, there will be few openings arising from the need for replacements. There will be keen competition for these openings because the number of degrees granted in astronomy probably will continue to exceed available openings.

Many of the new positions in colleges and universities may be temporary rather than permanent because the use of temporary faculty members usually is less costly and allows institutions to adjust faculty size more easily. Temporary jobs usually last for 2 years and are seldom renewed.

## Earnings

The average annual salary for astonomers was $26,000 in 1979, according to an American Astronomical Society survey. The average annual salary for astronomers and space scientists in the Federal Government was over $38,000 in 1980. Astronomers teaching in colleges and universities received salaries equivalent to those of other faculty members. (See statement on college and university teachers elsewhere in the *Handbook*.)

## Related Occupations

The work of astronomers is closely related to that of physicists, and astronomy often is thought of as a branch of physics. Other related occupations are physical scientists and mathematicians.

## Sources of Additional Information

For a pamphlet containing information on careers in astronomy and on schools offering training in the field, send 25 cents to:

Education Office, American Astronomical Society, University of Delaware, Newark, Del. 19711.

Nearly half of all chemists work in research and development.

# Chemists

(D.O.T. 022.061-010 and -014, .137-010, .161-010, .281-014; 041.061-026; and 090.227-010)

## Nature of the Work

The clothes we wear, the foods we eat, the houses in which we live—in fact, most things that help make our lives better, from medical care to a cleaner environment—result, in part, from the work done by chemists.

Chemists search for and put to practical use new knowledge about substances. Their research has resulted in the development of a tremendous variety of synthetic materials, such as nylon and polyester fabrics, ingredients that have improved other substances, and processes which help save energy and reduce pollution, such as improved oil refining methods.

Over half of all chemists work in research and development. In basic research, chemists investigate the properties, composition, and structure of matter and the laws that govern the combination of elements and reactions of substances. In applied research and development, they create new products or improve existing ones, often using knowledge gained from basic research. For example, synthetic rubber and plastics have resulted from research on small molecules uniting to form larger ones (polymerization).

The process of developing a product begins with descriptions of the characteristics it should have. If similar products exist, chemists test samples to determine their ingredients. If no such product exists, chemists experiment with various substances to develop a product with the required specifications.

Nearly one-sixth of all chemists work in production and inspection. In production, chemists prepare instructions (batch sheets) for plant workers that specify the kind and amount of ingredients to use and the exact mixing time for each stage in the process. At each step, samples are tested for quality control to meet industry and government standards. Chemists keep records and prepare reports showing results of tests.

Others work as marketing or sales representatives where they sell and provide technical information on chemical products. A number of chemists teach in colleges and universities. Some chemists are consultants to private industry and to government agencies.

Chemists often specialize in a subfield of chemistry. *Analytical chemists* determine the structure, composition, and nature of substances, and develop new analytical techniques. An outstanding example of the capabilities of this specialty was the analysis of moon rocks by an international team of analytical chemists. *Organic chemists* study the chemistry of carbon compounds. When combined with other elements, carbon forms a vast number of substances. Many modern commercial products, including plastics and other synthetics, have resulted from the work of organic chemists. *Inorganic chemists* study compounds other than carbon. They may, for example, develop materials to use in solid-state electronic components. *Physical chemists* study the physical characteristics of atoms and molecules and investigate how chemical reactions work. This research may result in new and better energy sources. *Biochemists*, considered chemists or life scientists, are discussed elsewhere in the *Handbook*. Some chemists specialize in the chemistry of foods. (See statement on food technologists elsewhere in the *Handbook*.)

## Working Conditions

Chemists usually work regular hours in offices, laboratories, or classrooms. Some are exposed to health or safety hazards when handling certain chemicals, but there is little risk if proper procedures are followed.

## Employment

About 113,000 persons worked as chemists in 1980. About one-half of all chemists work for manufacturing firms—about one-half of these are in the chemical manufacturing industry; the rest are scattered throughout other manufacturing industries.

Colleges and universities employed about 19,000 chemists in 1980. Chemists also work

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for State and local governments, primarily in health and agriculture, and for Federal agencies, chiefly the Departments of Defense, Health and Human Resources, Agriculture, and Interior. Smaller numbers work for nonprofit research organizations.

Chemists are employed in all parts of the country, but they are concentrated in large industrial areas.

## Training, Other Qualifications, and Advancement

A bachelor's degree with a major in chemistry or a related discipline is sufficient for many beginning jobs as a chemist. However, graduate training is required for most research jobs, and most college teaching jobs require a Ph.D. degree. Beginning chemists should have a broad background in chemistry, with good laboratory skills.

Many colleges and universities offer a bachelor's degree program in chemistry. About 550 are approved by the American Chemical Society. In addition to required courses in analytical, inorganic, organic, and physical chemistry, undergraduates usually study mathematics, liberal arts, and physics.

Several hundred colleges and universities award advanced degrees in chemistry. In graduate school, students generally specialize in a subfield of chemistry. Requirements for the master's and doctor's degree usually include a thesis based on independent research.

Students planning careers as chemists should enjoy studying science and mathematics, and should like working with their hands building scientific apparatus and performing experiments. Perseverance and the ability to concentrate on detail and to work independently are essential. Other assets include an inquisitive mind and imagination.

Graduates with the bachelor's degree generally begin their careers in government or industry by analyzing or testing products, working in technical sales or service, or assisting senior chemists in research and development laboratories. Some employers have training and orientation programs which provide special knowledge needed for the employer's type of work. Candidates for an advanced degree often teach or do research in colleges and universities while working toward their degrees.

Beginning chemists with the master's degree can usually go into applied research in government or private industry. They also may qualify for teaching positions in 2-year colleges and some 4-year colleges.

The Ph.D. generally is required for basic research, for teaching in colleges and universities, and for advancement to many administrative positions.

## Job Outlook

Employment opportunities in chemistry are expected to be good for graduates at all degree levels through the 1980's. The employment of chemists is expected to grow about as fast as the average for all occupations during this period. In addition to jobs arising from increased demand for chemists, many openings will result each year as chemists transfer to other occupations, retire, or die.

This outlook for chemists is based on the assumption that research and development expenditures of government and industry will increase through the 1980's at a faster rate than during the 1970's. If actual expenditures differ significantly from those assumed, the outlook for chemists would be altered.

The majority of job openings are expected to be in private industry, primarily in the development of new products. In addition, industrial companies and government agencies will need more chemists to help solve problems related to energy shortages, pollution control, and health care.

Little growth in college and university employment is expected. (See statement on college and university teachers elsewhere in the *Handbook*.)

Some graduates of baccalaureate programs will find openings in high school teaching after completing professional education courses and other requirements for a State teaching certificate. They usually are then regarded as teachers rather than chemists. Others may qualify as chemical or other types of engineers, especially if they have taken some courses in engineering. (See statements on secondary school teachers and engineers elsewhere in the *Handbook*.)

## Earnings

According to the College Placement Council, chemists with the bachelor's degree were offered starting salaries averaging $19,600 a year in 1981; those with the master's degree, $23,600; and those with the Ph.D., $29,800.

According to the American Chemical Society, salaries of experienced chemists having a bachelor's degree averaged $27,500 a year in 1981; for those with a master's degree, $30,000; and for those with a Ph.D., $35,000. In colleges and universities, the average salary of those with the master's degree was $21,400 and of those with the Ph.D., $26,200. Many chemists in educational institutions supplement their salaries with income from consulting, lecturing, and writing.

Depending on a person's college record, the annual starting salary in the Federal Government in early 1981 for an inexperienced chemist with a bachelor's degree was either $12,266 or $15,193. Those who had 2 years of graduate study could begin at $18,585 a year. Chemists having the Ph.D. degree could start at $22,486 or $26,951. The average salary for all chemists in the Federal Government in 1980 was $29,700 a year.

## Related Occupations

The occupations of chemical engineers, occupational safety and health workers, agricultural and biological scientists, food technologists, and chemical technicians are closely related to chemistry. Many manufacturers' sales representatives and wholesale trade sales workers in chemical marketing have backgrounds in chemistry, as do many technical writers. Other physical science and environmental science occupations are also related to chemistry.

## Sources of Additional Information

General information on career opportunities and earnings for chemists is available from:

American Chemical Society, 1155 16th St. NW., Washington, D.C. 20036.

Information on Federal job opportunities is available from local offices of State employment services and the U.S. Office of Personnel Management, and from Federal Job Information Centers located in various large cities throughout the country.

# Geographers

(D.O.T. 029.067 and .167-010; and 090.227-010)

## Nature of the Work

Geographers do research on a wide range of social, economic, and environmental issues. They study the distribution and location of various characteristics of the earth's surface. Such studies help to explain changing patterns of human settlement—where people live, why they are located there, and how they earn a living.

Geographers are involved in a variety of activities. Most are primarily researchers or analysts. They prepare reports and recommendations and may work for consulting firms, research organizations, business and industrial firms, or government agencies. Some geographers use their specialized knowledge and research skills in planning or administrative jobs in such fields as economic development or environmental resource management. Others are college or university teachers and, like other faculty members, do research and consulting in addition to teaching. (For more information, see the statement on college and university faculty elsewhere in the *Handbook*.)

Depending on their training and field of interest—or on a client's needs—a geographer might examine the distribution of landforms; study variations in climate, soils, or vegetation; or analyze such resources as water and minerals. Geographers are also concerned with human resources, and frequently their research overlaps that of social science disciplines. Thus, a geographer might study political organizations, transportation systems, marketing systems, patterns of industrial development, housing, or public health.

Research techniques depend on the topic under study. However, field study, including interviews and the use of surveying and meteorological instruments, is a standard technique. In addition, geographers analyze maps, aerial photographs, and data transmitted by satellites. Most geographers construct

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maps, graphs, and diagrams in the course of their research. Geographers typically make use of advanced statistical techniques and mathematical models—and, frequently, a computer—when they analyze or map the data they have obtained.

Geographers specialize, as a rule. *Economic geographers* deal with the geographic distribution of an area's economic activities—manufacturing, mining, forestry, agriculture, trade, and communications. Their research might be used, for example, to determine the costs and benefits of putting resources to use in a particular way. Many economic geographers work for private firms, evaluating and selecting the best locations for industrial sites.

*Political geographers* study the relationship of geography to politics. They define and describe the political boundaries of cities, counties, and administrative subdivisions, as well as offshore areas.

*Urban geographers* study cities and metropolitan regions. They provide background information and make recommendations in such areas as community development, housing, transportation, and industrial development.

*Physical geographers* focus on the physical characteristics of the earth. They study the earth's water systems, vegetation patterns, wildlife distribution, and climates. They also study the effect of physical characteristics on navigation and other activities. Typically, they specialize in a particular branch of physical geography such as geomorphology—the study of landforms—or hydrology—the study of water. Geographers specializing in climatology use atmospheric data to describe overall climatic conditions and to do research into the causes of climatic change. They may determine the significance of climatic conditions for defense, conservation, agriculture, health, transportation, marketing, and other activities.

*Regional geographers* study the physical, climatic, economic, political, and cultural characteristics of a particular region or area, which may range in size from a river basin to a State, a country, or even a continent. In addition to an understanding of the geography of a region, some knowledge of its history, customs, and languages may be necessary.

*Cartographers* compile and interpret data and design and construct maps and charts. They also conduct research in surveying and mapping techniques and procedures. Cartographers increasingly use computers in their work.

*Medical geographers* study the effect of the environment on health and take into account such factors as climate, vegetation, mineral traces in water, and atmospheric pollution. They work with public health officials, biostatisticians, and others to determine how our health is influenced by our physical surroundings—including access to health-care facilities.

Geographers may specialize even further in the subfields of agricultural geography, biogeography, conservation, cultural geography, geographical methods and techniques, historical geography, location analysis, satellite data interpretation, population geography, rural geography, social geography, and transportation.

Cartographers use data from satellite sensors to make maps.

## Working Conditions

Geographers working for government agencies and private firms often work regular 40-hour weeks. They often work alone behind a desk or a drafting table, reading and writing reports on their research or constructing maps and charts. Many experience the pressures of deadlines and tight schedules and sometimes must work overtime. Their routine may be interrupted by telephone calls, letters, special requests for information, meetings, or conferences. Geographers employed by colleges and universities, on the other hand, have much more flexible work schedules, dividing their time among teaching, research, and administrative responsibilities.

Increasingly, geographers are an integral part of a research team in the field. Physical stamina is important for these geographers because field work requires traveling to remote areas, and working long hours under severe weather conditions. Adaptability is also needed to adjust to different cultural environments.

## Employment

An estimated 15,000 persons worked as geographers in 1980. About two-fifths of all geographers work for private industry as researchers and planners; often, they specialize in location analysis. Geographers work for

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textbook and map publishers, travel agencies, manufacturing firms, real estate development corporations, insurance companies, communications and transportation firms, and chainstores. Some work for scientific foundations and research organizations or run their own research or consulting business. Colleges and universities employ over one-third of all geographers.

The Federal Government employs several thousand cartographers and several hundred geographers, primarily in the Departments of Defense and Interior. Geographers employed by State and local governments work mostly in the fields of urban and regional planning, economic development, and community development.

## Training, Other Qualifications, and Advancement

The minimum educational requirement for beginning positions in geography in government, industry, or secondary schools usually is a bachelor's degree with a major in the field. However, a master's degree increasingly is required for many entry level positions. Training in a specialty such as cartography, photogrammetry, satellite data interpretation, statistical analysis including computer science, or environmental analysis is helpful.

A master's degree is the minimum requirement for junior college positions and is important for advancement in business and government. A Ph.D. is required for most permanent teaching positions. The doctoral degree and a record of significant published research are required for a professorship and are necessary to gain tenure. The doctoral degree also is necessary for many senior level planning, research, and administrative positions in government, industry, research organizations, and consulting firms.

In the Federal Government, geographers generally must have a college degree with a minimum of 24 semester hours in geography or related fields. Cartographers need a college degree including at least 18 hours in one or a combination of the following: Cartography, photogrammetry, geodesy, or plane surveying. However, because competition for Federal jobs is keen, additional education or experience may be required.

About 340 colleges and universities offered programs in geography in 1980. Some departments of geography are combined with other disciplines such as urban planning or geology. To further illustrate the interdisciplinary nature of the field, courses in satellite data intepretation and photogrammetry often are offered not only in departments of geography but in geology, forestry, or engineering departments as well. Undergraduate study provides a general introduction to the field of geography and often includes field study. Research methods and writing skills also are taught. Typical courses offered are physical geography, cultural geography, climatology and meteorology, economic geography, medical geography, political geography, urban geography, and quantitative methods in geography. Courses in cartography, historical geography, ecology, natural resource planning, social geography, geography of transportation, geographic aspects of pollution, and geography of various regions also are offered. Geography majors should take appropriate electives in other departments. For example, courses in economics, architecture, urban planning, and urban and rural sociology are important for planners; courses in drawing, design, computer science, and mathematics are important for cartographers; and courses in physics, botany, and geology are important for physical geographers.

In 1980, about 150 institutions offered master's degree programs; 58 offered Ph.D. programs. Applicants for advanced degrees are required to have a bachelor's degree in one of the social or physical sciences with a substantial background in geography. The program of graduate study includes field and laboratory work as well as course work in geography and a thesis. Graduate schools also require course work in advanced mathematics, statistics, and computer science because of the increasing importance of quantitative research methods. A language may be required, especially for those students who plan to specialize in foreign regional geography. In recognition of the increasing importance of applied research, academic programs are putting more emphasis on preparing individuals to apply their knowledge to the solution of practical problems.

Students should select graduate schools that offer appropriate areas of specialization and good research opportunities in nearby libraries, archives, laboratories, and field stations. Internships or part-time employment for graduate students often may be available in government agencies or research, scientific, or industrial firms.

Persons who want to become geographers should enjoy reading, studying, and doing research because they must keep abreast of developments in the field. Creativity and intellectual curiosity are important, because geographers work with abstract ideas and theories in addition to doing practical studies. Patience and persistence help, because geographers spend long hours on independent study and problem solving. They also must be objective and systematic in their work. The ability to communicate ideas effectively, both orally and in writing, is important in this field, as it is in any research-oriented job. The ability to work well with others is often important. Cartographers, who handle drafting tools, need good vision, manual dexterity, and the ability to do detailed work requiring a high degree of precision.

## Job Outlook

Employment of geographers is expected to grow about as fast as the average for all occupations through the 1980's. Most openings are likely to result from deaths, retirements, and other separations from the labor force.

Demand for geographers will be greatest in urban and environmental management and planning, including such areas as location analysis, land and water resources planning, and health planning. Those with strong backgrounds in urban, economic, and physical geography and in quantitative research and computer-related techniques should be in particular demand. Significant demand also is expected for graduates with knowledge of satellite data interpretation, photogrammetry, and cartography. Private industry is expected to hire more geographers for market research and location analysis. The Federal Government may need additional personnel to work in programs such as health planning, regional development, environmental quality, and intelligence. Employment of geographers in State and local government is expected to expand, particularly in health planning; conservation; environmental quality; highway planning; and city, community, and regional planning and development. Since college and university enrollments are expected to decline during the 1980's, little or no employment growth is expected in academic jobs.

The employment outlook for geographers with the Ph.D. is expected to be favorable through the 1980's for research and administrative positions in government, industry, research organizations, and environmental and other consulting firms. Ph.D.'s face competition for academic positions, although those graduating from high-ranking universities may have an advantage. Persons qualified to teach quantitative research techniques, computer mapping, or natural resources management will have the best opportunities. Those with the master's degree will have very few opportunities for academic positions, although some may continue to find jobs in junior and community colleges. Some graduates are likely to accept temporary assignments with little or no hope of acquiring tenure.

An increasing proportion of geographers are expected to enter nonacademic positions. Graduates with a master's degree who have training in applied areas should have good opportunities for planning and marketing positions in government and industry; others may face competition.

Graduates with a bachelor's degree are expected to face strong competition for jobs as geographers. Those with quantitative skills and training in cartography, satellite data interpretation, or planning should have the best prospects. Many of these degree holders may find employment in government and industry as management or sales trainees, research assistants, or administrative assistants. Others may land jobs as research or teaching assistants in educational institutions while studying for advanced degrees. Some bachelor's degree holders teach at the high school level, although in some States the master's degree is becoming essential for high school teaching.

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## Earnings

According to an Association of American Geographers survey, starting salaries for Ph.D.'s with no teaching experience averaged around $17,000 for the academic year 1980-81, while the average salary of geographers employed in colleges and universities was about $26,000. Salaries of geographers in planning positions in business and industry are comparable to those in the Federal Government.

Geographers in educational institutions usually have an opportunity to earn income from other sources, such as consulting work, special research, and publication of books and articles.

The Federal Government recognizes education and experience in certifying applicants for entry level position. In general, geographers in the Federal Government with the bachelor's degree and no experience started at about $12,300 or $15,200 a year in early 1981, depending on their college achievement. Those with a master's degree started at $18,600 a year, and those with the Ph.D. started at $22,500. Geographers in the Federal Government averaged around $26,900 a year in 1980; cartographers averaged around $25,300.

## Related Occupations

Formal training in geography provides the background for a wide range of jobs requiring expertise in environmental resources, regional planning, and social science research. Examples of such jobs are aerial photo interpreter, climatologist, community development specialist, ecologist, intelligence analyst, map analyst, land economist, marketing analyst, regional planner, research analyst, site researcher, and transportation planner. Jobs such as these generally require knowledge not only of geography, but of other disciplines as well. Particularly useful are combinations of geography with economics, political science, sociology, anthropology, geology, or urban and regional planning.

## Sources of Additional Information

For additional information on careers and job openings for geographers, and on schools offering various programs in geography, contact:

Association of American Geographers, 1710 16th St. NW., Washington, D.C. 20009.

For additional information on careers in cartography, surveying, and geodesy, contact:

American Congress on Surveying and Mapping, 210 Little Falls St., Falls Church, Va. 22046.

For more information on careers and a list of schools that offer courses in photogrammetry and satellite data interpretation, contact:

American Society of Photogrammetry, 105 North Virginia Ave., Falls Church, Va. 22046.

# Geologists

(D.O.T. 024.061-010, -018, -022, -034, -038, -042, -046, -054; and .161-010)

## Nature of the Work

Geologists study the structure, composition, and history of the earth's crust. By examining surface rocks and drilling to recover rock cores, they determine the types and distribution of rocks beneath the earth's surface. They also identify rocks and minerals, conduct geological surveys, draw maps, take measurements, and record data. Geological research helps to determine the structure and history of the earth and may assist in predicting future geological events, such as earthquakes and volcanic eruptions. An important application of geologists' work is locating oil and other minerals.

Geologists use many tools and instruments such as hammers, chisels, levels, transits (mounted telescopes used to measure angles), gravity meters, cameras, compasses, and seismographs (instruments that record the intensity and duration of earthquakes and earth tremors). They may evaluate information from photographs taken from aircraft and satellites and use computers to record and analyze data.

Geologists also examine chemical and physical properties of specimens in laboratories under controlled temperature and pressure. They may study fossil remains of animal and plant life or experiment with the flow of water and oil through rocks. Laboratory equipment used by geologists includes complex instruments, such as the X-ray diffractometer, which determines the structure of minerals, and the petrographic microscope, used for close study of rock formations.

Besides locating resources and working in laboratories, geologists also advise construction companies and governmental agencies on the suitability of certain locations for constructing buildings, dams, or highways. Some geologists administer and manage research and exploration programs. Others teach and work on research projects in colleges and universities.

Geologists usually specialize in one or a combination of three general areas—earth materials, earth processes, and earth history.

*Economic geologists* locate earth materials such as minerals and solid fuels. *Petroleum geologists* attempt to locate oil and natural gas deposits below the earth's surface. Some petroleum geologists work on specific drilling projects, while others develop petroleum-related geologic information for entire regions. *Marine geologists* do research on the contours and deposits of the ocean bottom, study heat flow on the ocean floor, and investigate ocean basins for petroleum and mineral potential. *Engineering geologists* determine suitable sites for the construction of roads, airfields, tunnels, dams, and other structures. They decide, for example, whether underground rocks will bear the weight of a building or whether a proposed structure may be in an earthquake-prone area. *Mineralogists* analyze and classify minerals and precious stones according to composition and structure. *Geochemists* study the chemical composition and changes in minerals and rocks to understand the distribution and migration of elements in the earth's crust.

Geologists concerned with earth processes study landforms and their rock masses, sedimentary deposits (matter deposited by water or wind), and eruptive forces, such as volcanoes. *Volcanologists* study active and inactive volcanoes, lava flows, and other eruptive activity to try to predict their occurrence and minimize potential damage. *Geomorphologists* examine landforms and those forces, such as erosion and glaciation, which cause them to change.

Other geologists are primarily concerned with earth history. *Paleontologists* study plant and animal fossils found in geological formations to trace the evolution and development of past life. *Geochronologists* determine the age of rocks and landforms by the radioactive decay of their elements. *Stratigraphers* study the distribution and arrangement of sedimentary rock layers by examining their fossil and mineral content.

Many geologists specialize in new fields that require knowledge of another science as well. *Astrogeologists* study geological conditions on other planets. *Geological oceanographers* study the sedimentary and other rock on the ocean floor and continental shelf. (See statement on oceanographers elsewhere in the *Handbook*.)

## Working Conditions

Because most geologists divide their time between fieldwork and office or laboratory work, conditions of work vary. While in the field, geologists often travel to remote sites by helicopter or jeep and cover large areas by foot, often working in teams. Geologists in mining sometimes work underground. Exploration geologists often work overseas. When not working outdoors, geologists are in comfortable, well-lighted, well-ventilated offices and laboratories.

## Employment

An estimated 34,000 people worked as geologists in 1980. Most geologists work in private industry, primarily for petroleum companies. Geologists also work for mining and quarrying companies. Some are employed by construction firms. Others are independent consultants to industry and government.

The Federal Government employed over 2,400 geologists in 1980. About two-thirds worked for the Department of the Interior in the U.S. Geological Survey, the Bureau of Mines, and the Bureau of Reclamation. Other Federal agencies that employ geologists include the Departments of Defense, Agriculture, and Energy. State agencies also em-

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ploy geologists, some working on surveys in cooperation with the U.S. Geological Survey. Geologists also work for colleges and universities, nonprofit research institutions, and museums. Some are employed by American firms overseas for varying periods of time.

## Training, Other Qualifications, and Advancement

A bachelor's degree in geology or a related field is adequate for entry into some geology jobs. An advanced degree is helpful for promotion in most types of work and is essential for college teaching and many research positions.

Nearly 450 colleges and universities offer a bachelor's degree in geology. Undergraduate students take geology courses, including physical, structural, and historical geology, mineralogy, petrology, and invertebrate paleontology; and courses in mathematics, engineering, and related sciences, such as physics and chemistry.

More than 220 universities award advanced degrees in geology. Graduate students take advanced courses in geology and specialize in one branch of the science.

Geologists often work as part of a team. They should be curious, analytical, and able to communicate effectively. Those involved in fieldwork must have physical stamina.

Geologists usually begin their careers in field exploration or as research assistants in laboratories. With experience, they can be promoted to project leader, program manager, or other management and research positions.

## Job Outlook

Employment opportunities in geology are expected to be good for those with degrees in geology. The employment of geologists is expected to grow faster than the average for all occupations through the 1980's. In addition to new jobs created by increased demand for geologists, many openings will arise each year as geologists leave the occupation, retire, or die.

Increased prices for petroleum and the necessity to locate new sources of energy as older sources become exhausted will continue to stimulate domestic exploration activities and require many additional geologists. Additional geologists also will be needed to discover new resources and their potential uses, including the feasibility of using geothermal energy (steam from the earth's interior) to generate electricity. Geologists are needed to devise techniques for exploring deeper within the earth's crust and to develop more efficient methods of mining resources. They also are needed to develop adequate water supplies and waste disposal methods, and to do site evaluation for construction activities.

Federal agencies may hire more geologists over the next decade. Through the 1980's, jobs will depend heavily on the amount of Federal support provided for energy research and exploration for natural resources.

## Earnings

According to surveys done by the College Placement Council in 1980, graduates with bachelor's degrees in physical and earth sciences received average starting offers of $20,600 a year. Graduates with master's degrees in geology and related geological sciences received average starting offers of $24,600 per year.

In the Federal Government in early 1981, geologists having a bachelor's degree could begin at $12,300 or $15,200 a year, depending on their college records. Those having a master's degree could start at $15,200 or $18,600 a year; those having the Ph.D. degree, at $22,500 or $27,000. In 1980, the average salary for geologists employed in the Federal Government was about $30,000 a year.

## Related Occupations

Many geologists work in the petroleum and natural gas industry. This industry also employs many other workers who are involved in the scientific and technical aspects of petroleum and natural gas exploration and extraction, including drafters, engineering technicians, geophysicists, laboratory assistants (petroleum production), petroleum engineers, and surveyors.

## Sources of Additional Information

General information on training and career opportunities for geologists is available from:

American Geological Institute, 5202 Leesburg Pike, Falls Church, Va. 22041.

For information on Federal Government careers, contact:

U.S. Office of Personnel Management, 1900 E St. NW., Washington, D.C. 20415.

Geologists study rocks for clues to the formation and structure of the earth.

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# Geophysicists

(D.O.T. 024.061-014, -026, -030, -050; and .167-010)

## Nature of the Work

Geophysicists study the composition and physical aspects of the earth and its electric, magnetic, and gravitational fields. Geophysicists use highly complex instruments such as the magnetometer, which measures variations in the earth's magnetic field, and the gravimeter, which measures minute variations in gravitational attraction. They often use satellites to conduct tests from outer space and computers to collect and analyze data.

Geophysicists usually specialize in 1 of 3 general phases of the science—solid earth, fluid earth, and upper atmosphere. Some may also study other planets.

*Solid earth geophysicists* search for oil and mineral deposits, map the earth's surface, and study earthquakes. *Exploration geophysicists* use seismic prospecting techniques to locate oil and mineral deposits. They send sound waves into the earth and record the echoes bouncing off the rock layers below to determine if conditions are favorable for the accumulation of oil.

*Seismologists* study and interpret seismic data to locate earthquakes and earthquake faults. They explore for oil and minerals, study the effects of underground nuclear explosions, and provide information for constructing bridges, dams, and buildings. For example, in selecting a site for a dam, seismologists determine where bedrock (solid rock beneath the soil) is closest to the surface. They use explosives or other methods to create sound waves that reflect off bedrock; the time it takes for the shock wave to return to the surface indicates the depth of bedrock. Seismologists also seek to understand the causes of earthquakes so that one day they might be predicted.

*Geodesists* study the size, shape, and gravitational field of the earth and other planets. Their principal task is to make the precise measurements necessary for accurate mapping of the earth's surface. With the aid of satellites, geodesists determine the positions, elevations, and distances between points on the earth, and measure the intensity and direction of gravitational attraction.

*Hydrologists* study the distribution, circulation, and physical properties of underground and surface waters, including rivers, glaciers, snow, and permafrost. They may study the form and intensity of precipitation, its rate of infiltration into soil, and its return to the ocean and atmosphere. Some are concerned with water supplies, irrigation, flood control, and soil erosion. (See the statement on oceanographers, sometimes classified as geophysical scientists, elsewhere in the *Handbook*.)

Geophysicists also study the atmosphere, investigate the earth's magnetic and electric fields, and compare its outer atmosphere with those of other planets. *Geomagneticians* study the earth's magnetic field. *Paleomagneticians* learn about past magnetic fields from rocks or lava flows. *Planetologists* study the composition and atmosphere of the moon, planets, and other bodies in the solar system. They gather data from geophysical instruments placed on interplanetary space probes or from equipment used by astronauts during the Apollo missions. *Meteorologists* sometimes are classified as geophysical scientists. (See the statement on meteorologists elsewhere in the *Handbook*.)

Many geophysicists work for petroleum and natural gas companies.

## Working Conditions

Because many geophysicists divide their time between fieldwork and laboratory or office work, conditions of work vary. While doing fieldwork, they may travel for extended periods of time, sometimes overseas, and may conduct research in remote areas or aboard ships or aircraft. When not in the field, geophysicists work in modern, well-equipped, well-lighted laboratories and offices.

## Employment

An estimated 12,000 people worked as geophysicists in 1980. Most geophysicists work in private industry, chiefly for petroleum and natural gas companies. Others are in mining companies, exploration and consulting firms, and research institutes. A few are independent consultants and some do geophysical prospecting on a fee or contract basis.

About 2,800 geophysicists, geodesists, and hydrologists worked for Federal Government agencies in 1980, mainly the U.S. Geological Survey, the National Oceanic and Atmospheric Administration (NOAA), and the Department of Defense. Other geophysicists work for colleges and universities, State governments, and nonprofit research institutions.

## Training, Other Qualifications, and Advancement

A bachelor's degree in geophysics or a geophysical specialty is sufficient for most beginning jobs in geophysics. A bachelor's degree in a related field of science or engineering also is adequate preparation, if the person has courses in geophysics, physics, geology, mathematics, chemistry, and engineering.

Geophysicists doing research or supervising exploration activities should have graduate training in geophysics or a related science. Those planning to teach in colleges or do basic research should acquire a Ph.D. degree.

About 75 colleges and universities award the bachelor's degree in geophysics. Other programs offering training for beginning geo-

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physicists include geophysical technology, geophysical engineering, engineering geology, petroleum geology, and geodesy.

About 70 universities grant the master's degree in geophysics; about 50 schools offer the Ph.D. degree. Candidates with a bachelor's degree which includes courses in geology, mathematics, physics, engineering, or a combination of these subjects can be admitted to these programs.

Geophysicists often work as part of a team. They should be curious, analytical, and able to communicate effectively. Those involved in fieldwork must have physical stamina.

Most new geophysicists begin their careers doing field mapping or exploration. Some assist senior geophysicists in research laboratories. With experience, geophysicists can advance to jobs such as project leader or program manager, or other management and research jobs.

## Job Outlook

Employment opportunities are expected to be good for graduates with a degree in geophysics or a related field. Employment of geophysicists is expected to grow faster than the average for all occupations through the 1980's as petroleum and mining companies seek to employ more sophisticated techniques to find less accessible fuel and mineral deposits. Also, growth is expected as research activities expand on ways to productively harness cosmic and solar radiation as well as use geothermal power (steam from the earth's interior) to generate electricity.

Federal agencies may hire more geophysicists over the next decade. Through the 1980's, jobs will depend heavily on government support for energy research in both established and alternative sources. The Federal Government also may fund research to locate more natural resources and to prevent environmental damage through better land use.

Besides job openings created by growth in demand for geophysicists, many will be needed to replace those who leave the occupation, retire, or die.

## Earnings

According to surveys done by the College Placement Council in 1980, graduates with bachelor's degrees in physical and earth sciences received average starting offers of about $20,600 a year. Graduates with master's degrees in geology and related geological sciences received average starting offers of about $24,600 a year.

In the Federal Government in early 1981, geophysicists having a bachelor's degree could begin at $12,300 or $15,200 a year, depending on their college records. Geophysicists having a master's degree could start at $15,200 or $18,600 a year; those having a Ph.D. degree, at $22,500 or $27,000. In 1980, the average salary for geophysicists employed by the Federal Government was about $31,300 a year.

## Related Occupations

Geophysicists use basic scientific principles to investigate the nature and composition of the earth. Other scientists engaged in similar activities are chemists, geologists, meteorologists, and oceanographers.

## Sources of Additional Information

General information on career opportunities and training for geophysicists is available from:

American Geophysical Union, 2000 Florida Ave. NW., Washington, D.C. 20009.

Society of Exploration Geophysicists, P.O. Box 3098, Tulsa, Okla. 74101.

For information on Federal Government careers, contact:

U.S. Office of Personnel Management, 1900 E St. NW., Washington, D.C. 20415.

# Meteorologists

(D.O.T. 025.062-010)

## Nature of the Work

Meteorology is the study of the atmosphere, which is the air that surrounds the earth. Meteorologists try to understand the atmosphere's physical characteristics, motions, and processes, and determine the way the atmosphere affects the rest of our environment. The best known application of this knowledge is in understanding and forecasting the weather. Meteorological research also is applied in many other areas, such as air pollution control, fire prevention, agriculture, air and sea transportation, and studying trends in the earth's climate.

Meteorologists who specialize in forecasting the weather, known professionally as *operational meteorologists*, are the largest group of specialists. They study current weather information, such as air pressure, temperature, humidity, and wind velocity, in order to make short-range and long-range predictions. Their data come from weather satellites and observers in many parts of the world. Although some forecasters still prepare and analyze weather maps, most data now are plotted and analyzed by computers.

Some meteorologists are engaged in basic and applied research. For example, *physical meteorologists* study the chemical and electrical properties of the atmosphere. They do research on the effect of the atmosphere on transmission of light, sound, and radio waves, as well as study factors affecting formation of clouds, rain, snow, and other weather phenomena. Other meteorologists, known as *climatologists*, study trends in climate and analyze past records on wind, rainfall, sunshine, and temperature to determine the general pattern of weather that makes up an area's climate. These studies are used to plan heating and cooling systems, design buildings, and aid in effective land utilization.

Some meteorologists teach or do research—frequently combining both activities—in colleges and universities. In colleges without separate departments of meteorology, they may teach related courses, such as geography, mathematics, physics, chemistry, or geology, as well as meteorology.

## Working Conditions

Jobs in weather stations, which operate around the clock 7 days a week, often involve night work and rotating shifts. Most stations are at airports or in or near cities; some are in isolated and remote areas. Me-

Meteorologist uses automated equipment to observe weather.

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teorologists in smaller weather stations generally work alone; in larger ones, they work as part of a team.

## Employment

An estimated 4,000 persons worked as meteorologists in 1980. In addition to civilian meteorologists, thousands of members of the Armed Forces did forecasting and other meteorological work.

The largest employer of civilian meteorologists was the National Oceanic and Atmospheric Administration (NOAA), where about 1,800 worked at stations in all parts of the United States and in a small number of foreign areas. The Department of Defense employed about 200 civilian meteorologists. A few worked for State and local governments and for nonprofit organizations.

Commercial airlines employed meteorologists to forecast weather along flight routes and to brief pilots on atmospheric conditions. Others worked for private weather consulting firms, companies that design and manufacture meteorological instruments, and firms in aerospace, engineering, utilities, radio and television, and other industries.

Colleges and universities employed over 1,300 meteorologists in research and teaching.

## Training, Other Qualifications, and Advancement

A bachelor's degree with a major in meteorology is the usual minimum requirement for beginning jobs in weather forecasting. However, a bachelor's degree in a related science or engineering, along with some courses in meteorology, is acceptable for some jobs. For example, the Federal Government's minimum requirement for beginning jobs is a bachelor's degree with at least 20 semester hours of study in meteorology and courses in physics and mathematics, including calculus. However, employers prefer to hire those with an advanced degree, and an advanced degree is increasingly necessary for promotion.

For research and college teaching and for many top level positions in other meteorological activities, an advanced degree, preferably in meteorology, is essential. However, people with graduate degrees in other sciences also may qualify if they have advanced courses in meteorology, physics, mathematics, and chemistry.

In 1980, about 35 colleges and universities offered a bachelor's degree in meteorology or atmospheric science; about 40 schools offered advanced degrees. Many other institutions offered some courses in meteorology. Before selecting a degree program in meteorology, students should investigate the particular emphasis of the program since many meteorology programs are combined with the study of a related scientific or engineering field.

The Armed Forces give and support meteorological training, both undergraduate education for enlisted personnel and advanced study for officers.

Beginning meteorologists often start in jobs involving routine data collection, computation, or analysis. Experienced meteorologists may advance in academic rank or to various supervisory or administrative jobs. A few very well qualified meteorologists with a background in science, engineering, and business administration may establish their own weather consulting services.

## Job Outlook

Employment of meteorologists is expected to grow more slowly than the average for all occupations through the 1980's. The number of applicants applying for jobs in this very small occupation is likely to exceed the number of job openings generated by increased demand for meteorologists and from the need to replace those who change occupations, retire, or die. Persons with an advanced degree in meteorology should have the best job prospects.

Colleges and universities and the Federal Government, the major employers of meteorologists, are not expected to increase employment of meteorologists significantly during the 1980's. Employment of meteorologists in private industry may grow as companies recognize the value of having their own weather forecasting and meteorological services.

Since most meteorologists work for the Federal Government and colleges and universities, changes in funding for Federal meteorological programs or for meteorological research in academic institutions would influence the job outlook.

## Earnings

In early 1981, meteorologists in the Federal Government with a bachelor's degree and no experience received starting salaries of $12,300 or $15,200 a year, depending on their college grades. Those with a master's degree could start at $15,200 or $18,600; with the Ph.D. degree, at $22,500 or $27,000. The average salary for meteorologists employed by the Federal Government was $31,300 in 1980.

Meteorologists working in colleges and universities generally receive the same salaries as other faculty members. (See statement on college and university faculty elsewhere in the *Handbook*.)

## Related Occupations

Workers in other occupations concerned with the environment include forest ecologists, foresters, geologists, geophysicists, oceanographers, range managers, and soil conservationists.

## Sources of Additional Information

Information on career opportunities and schools that offer programs in meteorology is available from:

American Meteorological Society, 45 Beacon St., Boston, Mass. 02108.

For facts about job opportunities with the NOAA National Weather Service, contact:

National Weather Service, Manpower Utilization Staff, Gramax Bldg., 8060 13th St., Silver Spring, Md. 20910.

# Oceanographers

(D.O.T. 024.061-018, -030, and 041.061-022)

## Nature of the Work

Oceans cover more than two-thirds of the earth's surface and are a valuable source of food, fossil fuels, and minerals. They also influence the weather, serve as a "highway" for transportation, and offer many kinds of recreation. Oceanographers use the principles and techniques of natural science, mathematics, and engineering to study oceans—their movements, physical properties, and plant and animal life. Their research not only extends basic scientific knowledge, but also helps develop practical methods for forecasting weather, developing fisheries, mining ocean resources, and improving national defense.

Most oceanographers test their ideas about the ocean by making observations and conducting experiments at sea. They may study and collect data on ocean tides, currents, and other phenomena. They may study undersea mountain ranges and valleys, oceanic interactions with the atmosphere, and layers of sediment on and beneath the ocean floor.

Many oceanographers work primarily in laboratories on land where, for example, they measure, dissect, and photograph fish. They also study sea specimens and plankton (floating microscopic plants and animals). Much of their work entails identifying, cataloging, and analyzing different kinds of sea life and minerals. At other laboratories, oceanographers plot maps or use computers to test theories about the ocean. For example, they may study and test the theory of continental drift, which states that the continents were once joined together, have drifted to new positions, and continue to drift, causing the sea floor to spread in places. To present the results of their studies, oceanographers prepare charts, tabulations, and reports, and write papers for scientific journals.

Oceanographers use surface ships, aircraft, satellites, and various types of underwater craft to explore and study the ocean. They use specialized instruments to measure and record the findings of their explorations and studies; special cameras equipped with strong lights to photograph marine life and the ocean floor; and sounding devices to measure, map, and locate ocean materials. Research facilities equipped with large water tanks enable some oceanographers to simulate and study oceanic phenomena such as waves and tides.

Most oceanographers specialize in one branch of the science. *Biological oceanogra-*

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*phers* study plant and animal life in the ocean. The biological oceanographer's research has practical applications in improving and controlling commercial and sport fishing and in determining the effects of pollution on marine life. *Physical oceanographers* study the physical properties of the ocean such as waves, tides, and currents. Their research on the relationships between the sea and the atmosphere may lead to more accurate prediction of the weather. *Geological oceanographers* study the ocean's underwater mountain ranges, rocks, and sediments; some use the knowledge obtained to find valuable minerals, oil, and gas beneath the ocean floor. *Chemical oceanographers* investigate the chemical composition of ocean water and sediments as well as chemical reactions in the sea. *Oceanographic engineers* design and build instruments for oceanographic research and operations. They also lay cables and supervise underwater construction.

Many other scientists also work on problems related to oceans, but are counted in other scientific fields, such as biology, chemistry, or geology. Scientists who specialize in the study of fresh water aquatic life are called *limnologists*.

Oceanographer works on test equipment.

## Working Conditions

When conducting research in land-based laboratories, oceanographers work in clean and comfortable surroundings. Research on ocean expeditions requires oceanographers to be away from home for weeks or months at a time. Working and living areas on small research ships are sometimes cramped. Some oceanographers use scuba gear, submersible craft, and other equipment to work under water.

## Employment

An estimated 2,800 persons worked as oceanographers in 1980. Over one-half worked in colleges and universities, and about one-fourth for the Federal Government. Federal agencies employing substantial numbers of oceanographers include the Navy and the National Oceanic and Atmospheric Administration (NOAA). Some oceanographers work in private industry; a few work for fishery laboratories of State and local governments.

Although some oceanographers are employed in almost every State, most work in States that border on the ocean.

## Training, Other Qualifications, and Advancement

The minimum requirement for beginning jobs in oceanography is a bachelor's degree with a major in oceanography, biology, earth or physical sciences, mathematics, or engineering. However, most jobs, particularly in research and teaching, require graduate training in oceanography or a related science. For many high level positions, a doctoral degree in oceanography or a related science is preferred, and sometimes required.

About 65 colleges and universities offered undergraduate degrees in oceanography or marine sciences in 1980. However, undergraduate training in a basic science and a strong interest in oceanography may be adequate preparation for some beginning jobs and is a good background for graduate training in oceanography.

College courses needed to prepare for graduate study in oceanography include mathematics, physics, chemistry, geophysics, geology, meteorology, and biology. In general, college students who are not majoring in oceanography should specialize in the particular science that is closest to their area of oceanographic interest. For example, students interested in chemical oceanography should obtain a degree in chemistry.

In 1980, about 55 colleges offered advanced degrees in oceanography and marine sciences. In addition to advanced courses in oceanography and basic sciences, graduate programs are increasingly emphasizing training in specialized oceanographic research methods.

Graduate students in oceanography usually do research part time aboard ship to become familiar with the sea and with techniques used to obtain oceanographic information. Universities having oceanographic research facilities offer summer courses for both graduate and undergraduate students.

Beginning oceanographers with the bachelor's degree usually start as research or laboratory assistants, or in jobs involving routine data collection, computation, or analysis. Depending on their background and needs, most beginning oceanographers receive on-the-job training.

Experienced oceanographers often direct surveys and research programs or advance to administrative or supervisory jobs in research laboratories.

## Job Outlook

The number of persons seeking entry to this small field is likely to exceed the number of job openings created by increased demand for oceanographers and the need to replace those who transfer to other occupations, retire, or die. In general, those with a Ph.D. degree should have the best opportunities. Persons holding a Ph.D. degree in oceanography may have an advantage over those holding a Ph.D. degree in a related field because of their knowledge of specialized, increasingly sophisticated oceanographic research methods. Those with less education may find limited opportunities as research assistants or technicians.

Employment of oceanographers is expected to grow about as fast as the average for all occupations through the 1980's due to the increasing need for ocean research to recover offshore oil and other resources and to control pollution. Since the Federal Government finances much oceanographic research, Federal funding in this field could greatly influence the job outlook.

## Earnings

In early 1981, oceanographers in the Federal Government with a bachelor's degree received starting salaries of $12,300 or $15,200 a year, depending on their college grades. Those with a master's degree could start at $18,600 or $22,500; and those with a Ph.D. degree at $22,500 or $27,000. The average salary for experienced oceanographers in the Federal Government in 1980 was about $29,800 a year.

Oceanographers in educational institutions generally receive the same salaries as other faculty members. (See statement on college and university faculty elsewhere in the *Handbook*.) In addition to regular salaries, many

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earn extra income from consulting, lecturing, and writing.

## Related Occupations

Other occupations in which workers apply mathematical and scientific laws and principles to specific problems and situations include astronomers, chemists, geographers, geologists, geophysicists, life scientists, mathematicians, meteorologists, and physicists.

## Sources of Additional Information

For information about careers in oceanography, contact:

Dr. C. Schelske, Secretary, American Society of Limnology and Oceanography, I.S.T. Bldg., Great Lakes Research Division, University of Michigan, Ann Arbor, Mich. 48109.

Federal Government career information is available from any local office of the Federal Job Information Center or from:

U.S. Office of Personnel Management, 1900 E St. NW., Washington, D.C. 20415.

The booklet, *Training and Careers in Marine Science*, is available for $1 from:

International Oceanographic Foundation, 3979 Rickenbacker Causeway, Miami, Fla. 33149.

Some information on oceanographic specialties is available from professional societies listed elsewhere in the *Handbook*. (See statements on geologists, geophysicists, life scientists, meteorologists, and chemists.)

# Physicists

(D.O.T. 023.061-014, .067-010; 041.061-034; 079.021-010, -014; and 090.227-010)

## Nature of the Work

The flight of astronauts through space, the probing of ocean depths, and even the safety of the family car depend on research by physicists. Through systematic observation and experimentation, physicists describe in mathematical terms the structure of the universe and the interaction of matter and energy. Physicists develop theories that describe the fundamental forces and laws of nature. Determining the basic laws governing phenomena such as gravity, electromagnetism, and nuclear interactions leads to discoveries and innovations. For instance, the development of irradiation therapy equipment which destroys harmful growths in humans without damaging other tissues resulted from what physicists know about nuclear radiation. Physicists have contributed to scientific progress in recent years in areas such as nuclear energy, electronics, communications, aerospace, and medical instrumentation.

Most physicists work in research and development. Some do basic research to increase scientific knowledge. For example, they investigate the structure of the atom or the nature of gravity. The equipment that physicists design for their research can often be applied to other areas. For example, lasers (devices that amplify light and emit it in a narrow, intense beam) are utilized in surgery; microwave devices are used for ovens; and measurement techniques and instruments can detect and measure the kind and number of cells in blood or the amount of mercury or lead in foods.

Some engineering-oriented physicists do applied research and help develop new products. For instance, their knowledge of solid-state physics led to the development of transistors and then to the integrated circuits used in calculators and computers.

Many physicists teach and do research in colleges and universities. A small number work in inspection, testing, quality control, and other production-related jobs in industry. Some do consulting work.

Most physicists specialize in one or more branches of the science—elementary-particle physics; nuclear physics; atomic, electron, or molecular physics; physics of condensed matter; optics; acoustics; plasma physics; and the physics of fluids. Some specialize in a subdivision of one of these branches. For example, solid-state physics subdivisions include ceramics, crystallography, and semiconductors. However, since all physics involves the same fundamental principles, several specialties may overlap.

Growing numbers of physicists are specializing in fields such as astrophysics, biophysics, chemical physics, and geophysics that combine physics and a related science. Furthermore, the practical applications of physicists' work increasingly have merged with engineering.

## Working Conditions

Physicists generally work regular hours in laboratories, classrooms, and offices. Most physicists do not encounter unusual hazards in their work.

## Employment

Over 37,000 people worked as physicists in 1980. Private industry employed about one-half of all physicists, primarily in companies manufacturing electrical equipment, aircraft and missiles, and scientific instruments. Many others worked in hospitals, commercial laboratories, and independent research organizations.

Almost one-half of all physicists taught or did research in colleges and universities; some did both. Almost 5,000 physicists were employed by the Federal Government in 1980, mostly in the Departments of Defense and Commerce.

Although physicists are employed in all parts of the country, their employment is greatest in areas that have heavy industrial concentrations and large college and university enrollments. Nearly one-fourth of all physicists work in four metropolitan areas—Washington, D.C.; Boston, Mass.; New York, N.Y.; and Los Angeles-Long Beach, Calif., and more than one-third are concentrated in three States—California, New York, and Massachusetts.

## Training, Other Qualifications, and Advancement

Graduate training in physics or a closely related field is almost essential for most entry level jobs in physics and for advancement. The doctorate usually is required for full faculty status at colleges and universities and for industrial or government jobs administering research and development programs.

Those having master's degrees may qualify for some research jobs in private industry and in the Federal Government. In colleges and universities, some teach and assist in research while studying for their Ph.D.

Most physicists are engaged in research and development.

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Those having bachelor's degrees may qualify for a few applied research and development jobs in private industry and in the Federal Government. Some are employed as research assistants in colleges and universities while studying for advanced degrees. Many with undergraduate physics degrees work in engineering and other scientific fields. (See statements on engineers, geophysicists, programmers, and systems analysts elsewhere in the *Handbook*.)

Over 750 colleges and universities offer a bachelor's degree in physics. The undergraduate program provides a broad background in the science and serves as a base for later specialization either in graduate school or on the job. Some typical physics courses are mechanics, electromagnetism, electronics, optics, thermodynamics, and atomic and molecular physics. Students also take courses in chemistry and many courses in mathematics.

About 270 colleges and universities offer advanced degrees in physics. In graduate school, the student, with faculty guidance, usually works in a specific subfield of physics. Graduate students, especially candidates for Ph.D. degrees, spend a large portion of their time conducting research.

Students planning a career in physics should have an inquisitive mind, mathematical ability, and imagination. They should be able to work on their own, since physicists, particularly in basic research, often receive only limited supervision.

Physicists often begin their careers doing routine laboratory tasks. After some experience, they are assigned more complex tasks and may advance to work as project leaders or research directors. Some work in top management jobs. Physicists who develop new products or processes sometimes form their own companies or join new firms to exploit their own ideas.

## Job Outlook

Employment opportunities in physics are expected to be good through the 1980's for persons with graduate degrees in physics. Although employment of physicists is projected to grow more slowly than the average for all occupations over the period, the number of graduate degrees awarded annually in physics has been declining since 1970, and may remain at about the current level through 1990. Most job openings will arise as physicists transfer to other occupations, retire, or die.

Many physicists work in research and development (R&D). The anticipated increase in R&D expenditures through the 1980's should result in increased requirements for physicists. If actual R&D expenditure levels and patterns differ significantly from those assumed, however, the outlook would be altered.

Some physicists with advanced degrees will be needed to teach in colleges and universities, but opportunities will be better in private industry. Since little employment growth is expected in colleges and universities, most openings in this area will result from the need to replace physicists who leave the occupation.

Persons with only a bachelor's degree in physics are expected to face competition for physicist jobs through the 1980's. However, many with bachelor's degrees in physics find jobs as engineers, computer scientists, or technicians. Others with teaching certificates become high school physics teachers. However, they are usually regarded as teachers rather than as physicists. (See statement on secondary school teachers elsewhere in the *Handbook*.)

## Earnings

According to an American Institute of Physics Survey of 1980 degree recipients, starting salaries for physicists in private industry averaged about $21,500 for those with a master's degree and $27,300 for those with a Ph.D.

Depending on their college records, physicists with a bachelor's degree could start in the Federal Government in early 1981 at either $12,266 or $15,193 a year. Beginning physicists having a master's degree could start at $15,193 or $18,585, and those having the Ph.D. degree could begin at $22,486 or $26,951. Average earnings for all physicists in the Federal Government in 1980 were $34,700 a year.

Starting salaries on college and university faculties for physicists with the Ph.D. averaged $16,800 in 1980, according to the American Institute of Physics. (See statement on college and university teachers elsewhere in the *Handbook*.) Many faculty physicists supplement their regular incomes by working as consultants and taking on special research projects.

## Related Occupations

Physics is closely related to astronomy and other scientific occupations such as chemists, geologists, and geophysicists. Engineers and engineering and science technicians also use a knowledge of the principles of physics in their work.

## Sources of Additional Information

General information on career opportunities in physics is available from:

American Institute of Physics, 335 East 45th St., New York, N.Y. 10017.

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# Life Scientists

Life scientists study living organisms and their life processes such as growth, reproduction, and behavior. They apply knowledge gained from research to specific goals such as the development of drugs, special varieties of plants, and ways of maintaining a cleaner environment. They are concerned with the origin, preservation, and development of life, from the largest animal to the smallest living cell. Biological scientists study the basic life processes of plants and animals, and agricultural scientists apply their knowledge of biology to agricultural problems. Biochemists study the chemistry of life. Food technologists use the principles of biology and chemistry to develop better methods of processing, packaging, and preserving food. Foresters, range managers, and soil conservationists use their knowledge of life science to manage and conserve the natural resources of soil, forests, and rangelands. Detailed information about training requirements and job outlook in these occupations appears in the six statements that follow.

## Agricultural and Biological Scientists

(D.O.T. 040.061, except -026, -034, -046, and -054 through -062; 041.061 except -034; 041.261-010; and 090.227-010)

### Nature of the Work

Agricultural and biological scientists study all aspects of living organisms and the relationship of animals and plants to their environment. Although many specialize in some area such as ornithology (the study of birds) or microbiology (the study of microscopic organisms), all have in common the study of life.

About one-third of all agricultural and biological scientists are primarily involved in research and development. Many conduct basic research to increase knowledge of living organisms. Others in applied research use this knowledge in activities such as developing new medicines, increasing crop yields, and improving the environment. Those working in laboratories must be familiar with research techniques and the use of laboratory equipment and computers. Not all research, however, is performed in laboratories. For example, a botanist may do research in the volcanic valleys of Alaska to see what plants grow there.

About one-quarter of all agricultural and biological scientists work in management or administration, for example planning and administering programs for testing foods and drugs and directing activities at zoos or botanical gardens. About one-fifth teach in colleges or universities. Some work as consultants to business firms or to government while others test and inspect foods, drugs, and other products or write for technical publications. (See statement on technical writers elsewhere in the *Handbook*.) Some work in technical sales and service jobs for companies manufacturing chemicals or other technical products. (See statements on manufacturers' sales representatives and wholesale trade sales workers elsewhere in the *Handbook*.)

Many agricultural and biological scientists come under the broad category of *biologist* (D.O.T. 041.061-030). Most are further classified by the type of organism they study or by the specific activity they perform.

**Biological Scientists**. *Anatomists* (D.O.T. 041.061-010) study and examine the structure of organisms, from cell structure to the formation of tissues and organs. Many specialize in human anatomy. Research methods may entail dissections or the use of electron microscopes.

*Botanists* (D.O.T. 041.061-038) deal primarily with plants and their environment. Some study all aspects of plant life, while others specialize in areas such as identification and classification of plants, the structure of plants and plant cells, and the causes and cures of plant diseases.

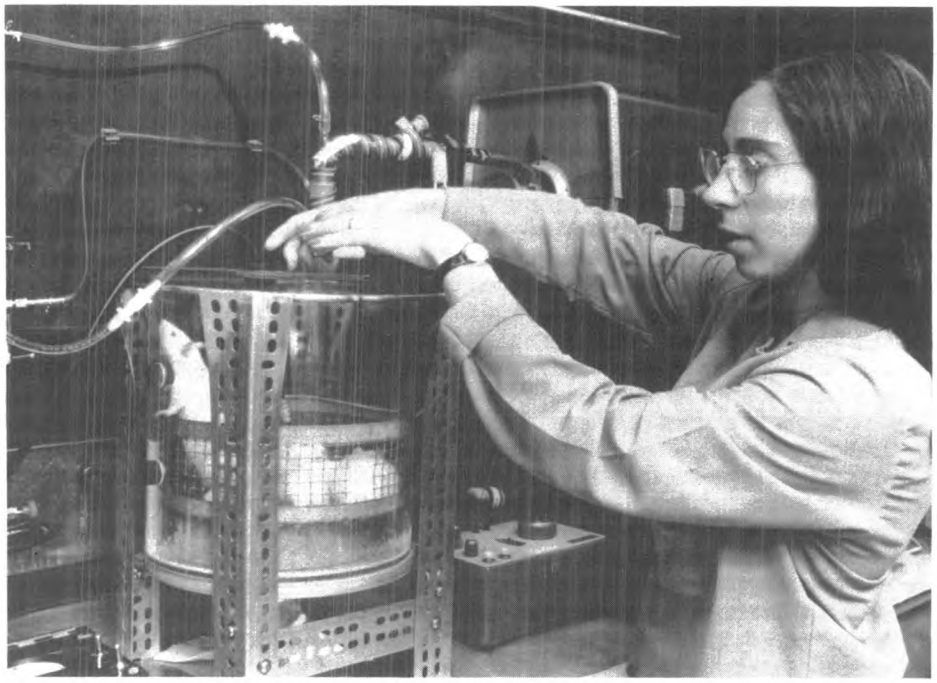
*Embryologists* study the development of an animal from a fertilized egg through the hatching process or birth, and the causes of healthy and abnormal development.

*Microbiologists* (D.O.T. 041.061-058) investigate the growth and characteristics of microscopic organisms such as bacteria, viruses, and molds. *Medical microbiologists* study the relationship between bacteria and disease or the effect of antibiotics on bacteria. Other microbiologists specialize in soil bacteriology (effect of microorganisms on soil fertility), virology (viruses), or immunology (mechanisms that fight infections).

*Pharmacologists* (D.O.T. 041.061-074) and *toxicologists* conduct tests on animals such as rats, guinea pigs, and monkeys to determine the effects of drugs, gases, poisons, dusts, and other substances on the functioning of tissues and organs. Pharmacologists may develop new or improved drugs and medicines.

*Physiologists* (D.O.T. 041.061-078) study life functions of plants and animals under normal and abnormal conditions. Physiologists may specialize in functions such as growth, reproduction, respiration, or movement, or in the physiology of a certain body area or system.

*Zoologists* (D.O.T. 041.061-090) study various aspects of animals—their origin, behavior, diseases, and life processes. Some experiment with live animals in controlled or natural surroundings while others dissect dead animals to study the structure of their parts. Zoologists are usually identified by the animal group studied—ornithologists (birds), entomologists (insects), mammalogists (mammals), herpetologists (reptiles), and ichthyologists (fish).



Laboratory animals are used to study the effects of test compounds.



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**Agricultural Scientists**. *Agricultural scientists* apply scientific principles to problems related to food, fiber, and horticulture. *Agronomists* (D.O.T. 040.061-010) are concerned with the mass development of plants. They improve the quality and yield of crops, such as corn, wheat, and cotton, by developing new growth methods or by controlling diseases, pests, and weeds. They also analyze soils to determine ways to increase acreage yields and decrease soil erosion.

*Animal scientists* (D.O.T. 040.061-014) do research on the breeding, feeding, and diseases of domestic farm animals.

*Horticulturists* (D.O.T. 040.061-038) work with orchard and garden plants such as fruit and nut trees, vegetables, and flowers. They seek to improve plant culture methods for the beautification of communities, homes, parks, and other areas as well as for increasing crop quality and yields.

*Veterinarians* (D.O.T. 073-061) study diseases and abnormal functioning in animals. (See statement on veterinarians elsewhere in the *Handbook*.)

Some agricultural and biological scientists apply their knowledge across a number of areas and may be classified by the functions performed. *Ecologists*, for example, study the relationship between organisms and their environments and the effects of influences such as pollutants, rainfall, temperature, and altitude on organisms. For example, ecologists examine plankton (microscopic water plants and animals) to determine the effects of pollution and measure the radioactive content of fish.

*Biochemists* and *biological oceanographers*, who may also be classified as biological scientists, are included in separate statements elsewhere in the *Handbook*.

## Working Conditions

Agricultural and biological scientists generally work regular hours in offices, laboratories, or classrooms and usually are not exposed to unsafe or unhealthy conditions. Some biological scientists such as botanists, ecologists, and zoologists may take field trips which involve strenuous physical activity and primitive living conditions.

## Employment

An estimated 125,000 persons worked as agricultural and biological scientists in 1980. About 35,000 were agricultural scientists, and 90,000 were biological scientists.

Colleges and universities employ over half of all agricultural and biological scientists, in both teaching and research. Many researchers in agronomy, horticulture, animal husbandry, entomology, and related areas work at State agricultural colleges and agricultural experiment stations.

About 12,500 agricultural and biological scientists worked for the Federal Government in 1980. Almost half worked for the Department of Agriculture, with large numbers also in the Department of the Interior and in the National Institutes of Health. State and local governments combined employed about 22,000.

Approximately 17,000 worked in private industry, mostly in the pharmaceutical, industrial chemical, and agricultural services industries in 1980. About 3,700 worked for nonprofit research organizations and foundations; a few were self-employed.

Employment of agricultural and biological scientists is concentrated in communities with large universities and in certain metropolitan areas—for example, nearly 6 percent work in the Washington, D.C., metropolitan area.

## Training, Other Qualifications, and Advancement

The Ph.D. degree generally is required for college teaching, for independent research, and for advancement to administrative research positions and other management jobs in agricultural and biological science. A master's degree is sufficient for some jobs in applied research. The bachelor's degree is adequate preparation for some beginning jobs, but promotions often are limited for those who hold no higher degree. New graduates with a bachelor's degree can start their careers in testing and inspecting jobs, or become technical sales and service representatives. They also may become advanced technicians, particularly in medical research or, with courses in education, high school biology teachers. (See statement on secondary school teachers elsewhere in the *Handbook*.)

Most colleges and universities offer agricultural and biological science curriculums. However, different schools may emphasize only certain areas. For example, liberal arts colleges may emphasize the biological sciences, while many State universities offer programs in agricultural science as well.

Students seeking careers in agricultural and biological science should obtain a broad undergraduate background in biology with courses in chemistry, physics, and mathematics.

Many colleges and universities confer advanced degrees in agricultural and biological science. Requirements for advanced degrees usually include fieldwork and laboratory research as well as classroom studies and preparation of a thesis.

Prospective agricultural and biological scientists should be able to work independently or as part of a team and must be able to communicate their findings clearly and concisely, both orally and in writing. Agricultural and biological scientists conducting field research in remote areas must have physical stamina.

Agricultural and biological scientists who have advanced degrees usually begin in research or teaching jobs. With experience, they may advance to jobs such as supervisors of research programs.

## Job Outlook

Employment opportunities for agricultural and biological scientists are expected to be good for those with advanced degrees through the 1980's, but those with lesser degrees may experience competition for jobs. However, an agricultural or biological science degree also is useful for entry to related occupations such as agricultural and biological technician, medical laboratory technologist, and health care occupations. Employment in agricultural and biological science is expected to increase about as fast as the average for all occupations over this period. In addition to jobs arising from growth in demand for agricultural and biological scientists, job openings will occur as some transfer to other occupations, retire, or die.

Employment in agricultural and biological science is expected to increase as a result of efforts to preserve the environment and continue medical research. Employment opportunities in industry and government should grow as environmental research and development increase. Concern over toxic substances will create many new openings for toxicologists and other biological scientists who are skilled in testing for cancer-causing substances.

Agricultural and biological scientists rarely lose their jobs during recessions, since most are employed in teaching, on long-term research projects, or in agriculture, activities which are not usually affected much by economic fluctuations.

## Earnings

According to the College Placement Council, beginning salary offers in private industry in 1981 averaged $15,400 a year for bachelor's degree recipients in agricultural science and $15,200 a year for bachelor's degree recipients in biological science.

In the Federal Government in early 1981, agricultural and biological scientists having a bachelor's degree could begin at $12,266 or $15,193 a year, depending on their college records. Those having the master's degree could start at $15,193 or $18,585, depending on their academic records or work experience, and those having the Ph.D. degree could begin at $22,486 or $26,951 a year. Agricultural and biological scientists in the Federal Government averaged $28,100 a year.

Salaries paid to college and university agricultural and biological science teachers are comparable to those paid to other faculty members. (See statement on college and university teachers elsewhere in the *Handbook*.)

## Related Occupations

Many occupations are related in some way to agricultural and biological science since they deal with living organisms. These include the conservation occupations of foresters, forestry technicians, range manangers, and soil conservationists, as well as biochemists, soil scientists, oceanographers, and life science technicians. The wide array of health occupations are all related to agricultural and biological science, as are occupations dealing with raising plants and animals such as farm-

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ers and farm workers, florists, and nursery workers.

### Sources of Additional Information

General information on careers in agricultural and biological science is available from:

American Institute of Biological Sciences, 1401 Wilson Boulevard, Arlington, Va. 22209.

American Physiological Society, Education Officer, 9650 Rockville Pike, Bethesda, Md. 20014.

Dr. Carol C. Baskin, Secretary, Botanical Society of America, School of Biological Sciences, University of Kentucky, Lexington, Ky. 40506.

For information on careers in horticultural science, send a stamped self-addressed envelope to:

American Society for Horticultural Science, 701 North Saint Asaph St., Alexandria, Va. 22314.

Information on Federal job opportunities is available from local offices of State employment services and the U.S. Office of Personnel Management or from Federal Job Information Centers located in various large cities throughout the country.

# Biochemists

(D.O.T. 041.061-026 and 090.227-010)

### Nature of the Work

Biochemists study the chemical composition and behavior of living things. Since life is based on complex chemical combinations and reactions, the work of biochemists is vital for an understanding of reproduction, growth, and heredity. Biochemists also may study the effects of food, hormones, or drugs on various organisms.

The methods and techniques of biochemistry are applied in areas such as medicine and agriculture. For instance, biochemists may investigate causes and cures for diseases, or conduct research on transferring characteristics of one kind of plant to another.

More than 3 out of 4 biochemists work in basic and applied research activities. The distinction between basic and applied research is often one of degree, and biochemists may do both types. Most, however, are in basic research. The few doing strictly applied research use the results of basic research to solve practical problems. For example, they use knowledge of how an organism forms a hormone to synthesize and produce hormones on a mass scale.

Laboratory research involves weighing, filtering, distilling, drying, and culturing (growing microorganisms). Some experiments also require the designing and constructing of laboratory apparatus or the use of radioactive tracers. Biochemists use a variety of instruments, including electron microscopes and centrifuges, and they may devise new instruments and techniques as needed. They usually report the results of their research in scientific journals or before scientific groups.

Some biochemists combine research with teaching in colleges and universities. A few work in industrial production and testing activities.

### Working Conditions

Biochemists usually work regular hours in laboratories, offices, and classrooms. Some biochemists travel occasionally to attend meetings and conferences. Biochemists' laboratory work usually is not dangerous or unhealthy, if proper procedures are observed.

### Employment

An estimated 16,000 biochemists were employed in 1980. About one-half worked for colleges and universities and about one-fourth for private industry. Some worked for nonprofit research institutes and foundations; others, for Federal, State, and local government agencies. Most government biochemists do health and agricultural research for Federal agencies. A few self-employed biochemists are consultants to industry and government.

### Training, Other Qualifications, and Advancement

The minimum educational requirement for many beginning jobs as a biochemist, especially in research or teaching, is an advanced degree. A Ph.D. degree is a virtual necessity for persons who hope to contribute significantly to biochemical research and for advancement to many management and administrative jobs. A bachelor's degree with a major in biochemistry or chemistry, or with a major in biology and a minor in chemistry, may qualify some persons for entry jobs as research assistants or technicians.

Biochemists spend much of their time in the laboratory.

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About 100 schools award the bachelor's degree in biochemistry, and nearly all colleges and universities offer a major in biology or chemistry. Persons planning careers as biochemists should take undergraduate courses in chemistry, biology, biochemistry, mathematics, and physics.

About 150 colleges and universities offer graduate degrees in biochemistry. Graduate students generally are required to have a bachelor's degree in biochemistry, biology, or chemistry. Many graduate programs emphasize one specialty in biochemistry because of the facilities or the research being done at that school—so students should select their schools carefully. Graduate training requires actual research in addition to advanced science courses. For the doctoral degree, the student does intensive research and a thesis in one field of biochemistry.

Persons planning careers as biochemists should be able to work independently or as part of a team. Biochemists should have analytical ability and curiosity, as well as the patience and perseverance needed to complete the hundreds of experiments necessary to solve a single problem. They should also express themselves clearly when writing and speaking to communicate the findings of their research effectively.

Graduates with advanced degrees may begin their careers as teachers or researchers in colleges or universities. In private industry, most begin in research jobs and with experience may advance to positions in which they plan and supervise research.

New graduates with a bachelor's degree usually start work as research assistants or technicians. These jobs in private industry often involve testing and analysis. In the drug industry, for example, research assistants analyze the ingredients of a product to verify and maintain its purity or quality.

## Job Outlook

Job opportunities for biochemists with advanced degrees should be favorable through the 1980's. The employment of biochemists is expected to grow about as fast as the average for all occupations during this period. In addition to jobs arising from increased demand for biochemists, some job openings will result each year as biochemists retire, die, or transfer to other occupations.

The recent advances in recombinant DNA (gene splicing) and other areas of biochemical research may have much commercial potential. Therefore there are likely to be many openings in private industry for those with the knowledge to conduct research in areas of biochemisty with commercial applications. Additional growth in this field should result from the effort to find cures for cancer, heart disease, and other diseases, and from public concern with environmental protection. Colleges and universities may need additional teachers if biochemistry enrollments continue to increase.

## Earnings

According to a 1980 survey by the American Chemical Society, median salaries for experienced biochemists were about $20,500 for those with a bachelor's degree; $22,500 for those with a master's degree; and $30,000 for those with a Ph.D.

Salaries of biochemists employed in colleges and universities are comparable to those for other faculty members. (See statement on college and university teachers elsewhere in the *Handbook*.)

## Related Occupations

Biochemistry is closely related to biology and chemistry. Medical laboratory workers often use biochemical procedures in their work, and physicians, pharmacists, and other health practitioners need to know a great deal about biochemistry.

## Sources of Additional Information

For general information on careers in biochemistry, contact:

American Society of Biological Chemists, 9650 Rockville Pike, Bethesda, Md. 20014.

# Food Technologists

(D.O.T. 041.081-010 and 090.227-010)

## Nature of the Work

In the past, consumers processed most food in the home, but today industry processes almost all foods. A key worker in the development and processing of the large variety of foods available today is the *food technologist*.

Food technologists study the chemical, physical, and biological nature of food to learn how to safely process, preserve, package, distribute, and store it and to insure an adequate, nutritious, wholesome, and economical supply. Almost one-third of all food technologists work in research and development. Others work in quality assurance laboratories or in production or processing areas of food plants. Some teach or do basic research in colleges and universities, and others work in sales or management positions.

Food technologists in basic research study the structure and composition of food and the changes it undergoes in storage and processing. For example, they may develop new sources of proteins, study the effects of processing on micro-organisms, or search for factors that affect the flavor, texture, or appearance of foods. Food technologists who work in applied research and development create new foods and develop new processing methods. They also work to improve existing foods by making them more nutritious and enhancing their flavor, color, and texture.

Food technologists seek ways to retain the characteristics and nutritive value of foods during processing and storage. They also conduct chemical and microbiological tests to see that products meet industry and government standards, and determine their nutritive content for federally required labeling. For example, they test processed foods for sugar, starch, protein, fat, vitamin, and mineral content.

In quality control laboratories, food technologists check raw ingredients for freshness, maturity, and suitability for processing. Periodically, they inspect processing line operations to insure conformance with government and industry standards. They make sure that, after processing, various enzymes are inactive and bacterial levels are low enough so that the food will not spoil or present a safety hazard.

Food technologist testing samples in a quality control laboratory.

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Other food technologists develop and improve packaging and storage methods.

Food technologists in processing plants prepare production specifications, schedule processing operations, maintain proper temperature and humidity in storage areas, and supervise sanitation operations, including the proper disposal of wastes. To increase efficiency, they advise management on the purchase of equipment and recommend new suppliers.

Some food technologists apply their knowledge in areas such as market research, advertising, and technical sales. Others teach in colleges and universities.

## Working Conditions

Most food technologists work regular hours in offices, laboratories, or classrooms. Those in production or quality control positions work in or near food processing areas, sometimes under noisy, hot, or cold conditions.

## Employment

An estimated 15,000 persons worked as food technologists in 1980. Food technologists are employed in every State, but the products they work with vary by locality. For example, many technologists in Maine and Idaho work with potatoes; in the Midwest, with cereal and meat products; and in Florida and California, with citrus fruits and vegetables.

Most food technologists work in the food processing industry. Some work for Federal agencies such as the Food and Drug Administration and the Departments of Agriculture and Defense; others work for State regulatory agencies. A few work for private consulting firms and international organizations such as the United Nations. Some teach or do research in colleges and universities. (See statement on college and university teachers elsewhere in the *Handbook*.)

## Training, Other Qualifications, and Advancement

A bachelor's degree with a major in food technology is the usual minimum requirement for beginning jobs in food technology. Some food technologists have degrees in a variety of other areas such as chemistry, biology, engineering, agriculture, or business. Almost one-half have advanced degrees, which are necessary for college teaching and many management and research positions.

About 55 colleges and universities offered programs leading to the bachelor's degree in food technology in 1980. Undergraduate students majoring in food technology usually take courses in physics, biochemistry, mathematics, microbiology, the social sciences and humanities, and business administration, as well as food technology courses such as food preservation, processing, sanitation, and marketing.

Most colleges and universities with undergraduate food technology programs also offer advanced degrees. Graduate students usually specialize in a particular area of food technology. Requirements for the master's or doctor's degree usually include extensive research and a thesis, which is a report of original research findings. Food technologists who specialize in administrative, managerial, or regulatory areas sometimes take advanced degrees in business administration or law rather than food technology.

People planning careers as food technologists should have analytical minds, be able to express their ideas clearly, and like details and technical work.

Food technologists with a bachelor's degree might start work as quality assurance chemists or as assistant production managers. After gaining experience, they can advance to more responsible management jobs. A food technologist might also begin as a junior food chemist in a research and development laboratory of a food company, and be promoted to section head or other research management positions.

People who have master's degrees may begin as food chemists in a research and development laboratory. Those who have the Ph.D. degree usually begin their careers doing basic research or teaching.

## Job Outlook

Employment of food technologists is expected to grow more slowly than the average for all occupations through the 1980's, primarily because of anticipated slow growth in the food processing industry, where most are employed. Most openings will result from the need to replace those who die, retire, or transfer to other fields, rather than from growth in demand for these workers.

Employment of food technologists is expected to grow somewhat as the food industry responds to the challenge of providing wholesome and economical foods that can meet changing consumer preferences and food standards. In addition, both private households and food service institutions that supply customers such as airlines and restaurants will demand a greater quality of convenience foods.

In recent years, expenditures for research and development in the food industry have increased moderately and probably will continue to rise, creating more jobs for technologists. Through research, new foods are being produced from modifications of wheat, corn, rice, and soybeans. For example, food scientists are working to improve "meat" products made from vegetable proteins. There will be an increased need for food scientists in quality control and production because of the complexity of products and processes and the application of higher processing standards.

## Earnings

According to a survey of the Institute of Food Technologists, food technologists with a bachelor's or master's degree and 11 to 15 years of experience earned about $32,000 in 1980, and those with the Ph.D. degree and 11 to 15 years of experience earned about $36,500. The median salary for all food technologists was about $29,500 in 1980. The average salary for experienced food technologists in the Federal Government was about $30,500 a year in 1980.

## Related Occupations

The work of food technologists is closely related to that of chemists and, to a lesser extent, to biologists. Other occupations in which the work is related to food technology are agricultural and environmental scientists, engineers, and engineering and science technicians.

## Sources of Additional Information

For information on careers in food technology, contact:

Institute of Food Technologists, Suite 2120, 221 North LaSalle St., Chicago, Ill. 60601.

# Foresters

(D.O.T. 040.061-034, -050, and -062)

## Nature of the Work

Forests are one of our most important natural resources. We use their products—trees—for building materials, paper, fuel, and a variety of other uses. The forests help clean the air we breathe, protect our water supplies and wildlife, and provide us with recreational opportunities. Foresters manage, develop, and protect them for use now and in the future.

Foresters plan and supervise the growing, protection, and harvesting of trees. They make maps of forest areas, estimate the amount of standing timber and future growth, and manage timber sales. All of these things involve working with other people. Managing timber sales, for example, involves dealing with landowners and supervising the work of loggers. Foresters also protect the trees from fire, harmful insects, and disease.

Some foresters perform other duties ranging from wildlife protection and watershed management to the development and supervision of camps, parks, and grazing lands. Other foresters do research, provide information to forest owners and to the general public (called extension work), and teach at colleges and universities.

Foresters often specialize in one area of work, such as timber management, outdoor recreation, or forest economics.

## Working Conditions

Working conditions for foresters vary considerably, according to the type of work they perform. The image of foresters as solitary horseback riders, singlehandedly protecting large areas of land far from civilization no longer holds true. Modern foresters spend a great deal of time working with people. They

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must deal constantly with landowners, loggers, forestry aides, and a wide variety of other people.

The work can still be physically demanding, though. Beginning foresters often spend considerable time outdoors in all kinds of weather, sometimes in remote areas. To get to these areas, they use airplanes, helicopters, and four-wheel drive vehicles. Foresters also may have to work long hours on emergency duty, as in firefighting or search and rescue missions.

## Employment

Almost 30,000 persons worked as foresters in 1980. Nearly one-half worked for the Federal Government, primarily in the Forest Service of the Department of Agriculture. About one-fourth worked for State governments. The remainder worked in private industry, mainly for pulp and paper, lumber, logging and milling companies, and for local governments, colleges and universities, and consulting firms. A few were self-employed either as consultants or forest owners.

Although foresters are employed in every State, employment is concentrated in the Western and Southeastern States where many national forests and parks are located and where most of the lumber and pulpwood producing forests are located.

## Training, Other Qualifications, and Advancement

A bachelor's degree in forestry is the minimum educational requirement for professional careers in forestry. However, due to keen job competition and the increasingly complex nature of the forester's work, many employers prefer graduates who hold advanced degrees. Certain jobs such as teaching and research require advanced degrees.

To qualify for college forestry programs, high school students should take courses in chemistry, physics, mathematics, and the biological sciences. Courses in English literature and public speaking also are helpful.

Education in forestry leading to a bachelor's or higher degree was offered in 1980 by 49 colleges and universities, of which 43 were accredited by the Society of American Foresters. Curriculums stress the liberal arts and communications skills as well as technical forestry subjects. Courses in forest economics and business administration supplement the student's scientific and technical knowledge. Many colleges require students to spend one summer in a field camp operated by the college. All schools encourage summer jobs that give experience in forest or conservation work.

In addition to meeting the intellectual demands of forestry, foresters must enjoy working outdoors, be physically hardy, and be willing to move, often to remote places. Foresters should also work well with people and express themselves clearly.

Recent forestry graduates usually work under the supervision of experienced foresters. After gaining experience, they may advance to more responsible positions. In the Federal Government, an experienced forester may supervise an entire forest area, and may advance to regional forest supervisor or to a top administrative position. In private industry, foresters start by learning the practical and administrative aspects of the business. Many foresters work their way up to top managerial positions within their companies.

Many experienced foresters advance to office jobs where they plan and organize the activities of the staff.

## Job Outlook

In recent years the number of persons earning degrees in forestry has exceeded the number of openings in the field, creating competition for jobs. If the number of degrees granted each year remains at present levels, competition is expected to persist throughout the period. Opportunities will be better for persons with an advanced degree.

Employment of foresters is expected to grow more slowly than the average for all occupations through the 1980's. Employment will probably continue to grow faster in private industry than in the Federal Government where budget limitations may restrain growth. The country will need more foresters in private industry to ensure an increasing output of forest products. Private owners of timberland also are likely to employ more foresters as they recognize the need for—and the higher profitability of—improved forestry and logging practices. Besides job openings created by growth in demand, many foresters will be needed each year to replace those who die, retire, or transfer to other occupations.

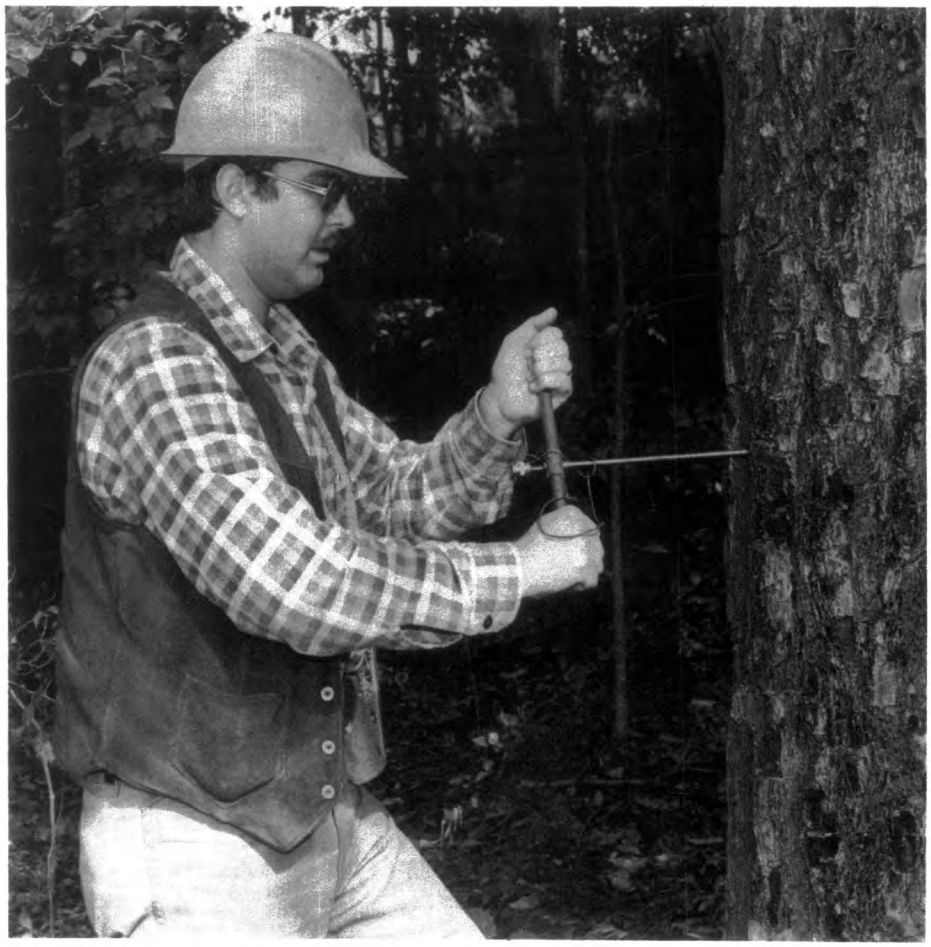
## Earnings

Beginning foresters in 1980 averaged about $13,900 a year, while experienced foresters averaged about $24,000.

In private industry, starting foresters averaged $15,200 a year in 1980, and the overall average salary was $25,200.

Graduates entering the Federal Government as foresters in early 1981 with just a bachelor's degree started at $12,266 a year. However, because of keen competition, most foresters hired by the Federal Government either held a master's degree or had some experience, and generally started at $15,193 a year. Ph.D.'s generally started at $18,585 or $22,486 a year. The median annual salary in early 1981 for federally employed foresters was $26,500.

In local government, foresters generally began at about $12,700 a year in 1980, while their median annual salary was $19,400. Starting salaries in State governments were about $12,600 in 1980, and State median salaries were $20,400 per year. College professors generally started at about $19,600 annually in 1980, while their median salary



Foresters take core samples from trees to assess the age and growth rate of timber stands.

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was over $26,000 per year. Many faculty foresters supplement their regular salaries with income from lecturing, consulting, and writing.

### Related Occupations

Foresters are not the only workers concerned with managing, developing, and protecting natural resources. Other workers with similar responsibilities include agronomists, farmers, farm managers, ranchers, range managers, fish hatchery managers, soil conservationists, and wildlife managers.

### Sources of Additional Information

General information about the forestry profession and lists of schools offering education in forestry are available from:

Society of American Foresters, 5400 Grosvenor Lane, Bethesda, Md. 20814.

American Forestry Association, 1319 18th St. NW., Washington, D.C. 20036.

For details on forestry careers in the Forest Service, contact:

U.S. Department of Agriculture, Forest Service, P.O. Box 2417, Washington, D.C. 20013.

## Range Managers

(D.O.T. 040.061-046)

### Nature of Work

Rangelands cover more than 1 billion acres of the United States, mostly in the Western States and Alaska. They contain many natural resources: Grass and shrubs for animal grazing, wildlife habitats, water from vast watersheds, recreation facilities, and valuable mineral and energy resources. Rangelands also serve as areas for scientific study of the environment.

Range managers, sometimes called *range scientists, range ecologists*, or *range conservationists*, manage, improve, and protect range resources to maximize their use without damaging the environment. For example, range managers help ranchers attain optimum livestock production by determining the number and kind of animals to graze, the grazing system to use, and the best season for grazing. At the same time, however, they conserve the soil and vegetation for other uses such as wildlife habitat, outdoor recreation, and timber.

Range managers restore and improve rangelands through controlled burning, reseeding, and biological, chemical, or mechanical control of undesirable plants. For example, some rangelands that have been invaded by sagebrush or other shrubs may be plowed and reseeded with more desirable plants. Range managers also determine the need for and help carry out range conservation and development plans that provide for water facilities, erosion control, and soil treatments.

Not all of a range manager's time is spent outdoors. Range managers consult with other conservation specialists, prepare written reports, and do administrative work in an office.

Because of the multiple use of rangelands, range managers often work in closely related fields such as wildlife and watershed management, forest management, and recreation.

### Working Conditions

Range managers usually begin their careers on the range. They work outdoors in all kinds of weather and may spend considerable time away from home. Range managers travel by car or small plane, or, in rough country, by four-wheel drive vehicle, by horse, or on foot.

Many range managers work for the Federal Government.

There is much more to the job than simply riding the range, however. Range managers must constantly deal with people, including the general public, ranchers, government officials, and other conservation specialists. In many cases, they work as part of a team.

Many range managers advance to administrative jobs where they write reports and plan and supervise the work of others.

### Employment

An estimated 4,000 persons worked as range managers in 1980. Most worked for the Federal Government, principally for the Forest Service and the Soil Conservation Service of the Department of Agriculture, and the Bureau of Indian Affairs and the Bureau of Land Management of the Department of the Interior. Range managers in State governments are employed in game and fish departments, State land agencies, and extension services.

An increasing number of range managers work for private industry. Coal and oil companies employ range managers to help restore or reclaim mined areas. Banks and real estate firms employ them to help increase the revenue from their landholdings. Other range managers work for private consulting firms and large ranches.

Some range managers who have advanced degrees teach and do research at colleges and universities. Other range managers work overseas with United States and United Nations agencies and with foreign governments.

### Training, Other Qualifications, and Advancement

A bachelor's degree in range management or range science is the usual minimum educational requirement for range managers. The Federal Government requires at least 42 hours in plant, animal or soil sciences and natural resources management courses, including at least 18 hours in range management. Graduate degrees in range management generally are required for teaching and research positions, and may be helpful for advancement in other jobs.

In 1980, about 18 colleges and universities offered degree programs in range management or range science. A number of other schools offered some courses in range management.

A degree in range management requires a basic knowledge of biology, chemistry, physics, mathematics, and communication skills. Specialized courses combine plant, animal, and soil sciences with principles of ecology and resource management. Desirable electives include economics, forestry, hydrology, agronomy, wildlife, computer science, and recreation.

Federal agencies, primarily the Forest Service, the Soil Conservation Service, and the Bureau of Land Management, hire college students for summer jobs in range management. This experience may better qualify these students for jobs when they graduate.

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Besides having a love for the outdoors, range managers must be able to write and speak effectively and work well with others. They should be able to work either alone or under direct supervision. Good physical health and stamina also are important.

## Job Outlook

Employment of range managers is expected to grow about as fast as the average for all occupations through the 1980's. Most openings in this small occupation will result from the need to replace range managers who retire, die, or leave the occupation for other reasons.

The growing demand for red meat, wildlife habitats, recreation, and water, as well as increasing environmental concern should stimulate the need for more range managers. Since the amount of land cannot be expanded, range managers will need to increase productivity while they maintain the environmental quality of the range ecosystem. Also, range managers will be in greater demand to manage large ranches, which are increasing in number.

As oil and coal exploration accelerates, private industry will require many more range specialists to reclaim or restore mined lands to a productive state.

The use of rangelands for other purposes such as wildlife habitat and recreation could create additional need for range managers. Federal employment for these activities depends heavily upon legislation concerning the management of range resources. Federal budgetary limitations are expected to limit employment growth in this area, at least in the short run.

## Earnings

In the Federal Government, range managers with a bachelor's degree started at either $12,266 or $15,193 a year in early 1981, depending on their college grades. Those having 1 or 2 years of graduate work began at $15,193 or $18,585. Range managers with the Federal Government averaged about $20,700 a year in 1980.

Salaries for range managers who work for State governments and private companies are about the same as those paid by the Federal Government, according to limited data.

## Related Occupations

Range managers are not the only workers who plan and manage the use of natural resources. Other workers with similar duties include animal breeders, farmers, farm managers, foresters, ranchers, fish hatchery managers, wildlife managers, and soil conservationists.

## Sources of Additional Information

Information about a career as a range manager as well as a list of schools offering training is available from:

Society for Range Management, 2760 W. 5th Ave., Denver, Colo. 80204.

For information about career opportunities in the Federal Government, contact:

Bureau of Land Management, Denver Service Center, Federal Center Building 50, Denver, Colo. 80225.

U.S. Department of Agriculture, Forest Service, P.O. Box 2417, Washington, D.C. 20013.

U.S. Department of Agriculture, Soil Conservation Service, P.O. Box 2890, Washington, D.C. 20013.

# Soil Conservationists

(D.O.T. 040.061-054)

## Nature of the Work

Soil conservationists provide technical assistance to farmers, ranchers, and others concerned with the conservation of soil, water, and related natural resources. They help farmers and other land managers develop programs that make the most productive use of land without damaging it. Soil conservationists do most of their work in the field. If a farmer is experiencing an erosion problem, the conservationist will visit the farm, find the source of the problem, and help develop a program to combat the erosion. For example, if the erosion is caused by water runoff on sloping fields, the conservationist may recommend terracing the land, constructing waterways, conservation tillage systems, or changing the land to permanent vegetation. If erosion results from wind, the conservationist may recommend growing hedges to provide windbreaks or may suggest leaving the wheat or corn stalks on the field after harvesting to provide ground cover.

In many areas of the country—particularly in the West—rainfall is insufficient to permit the growing of crops. Much of the land, however, is suitable for grazing livestock. Soil conservationists inventory pastureland and rangeland, and recommend to farmers and ranchers areas where ponds can be constructed to provide water for livestock. They also recommend solutions to problems of overgrazing, such as seeding grassland or placing salt licks in undergrazed areas to keep the livestock away from areas that have been overgrazed. In this manner, they can distribute herds so that the concentration of animals in any one area does not exceed the replaceable food supply.

Soil conservationists pay close attention to weather patterns to be aware of possible conservation problems before they arise. During the winter months, they make periodic snowmobile or ski patrols into the Rockies and other mountainous areas of the West to measure snowfall. This enables them to predict the spring and summer water runoff. In years when the snowfall is light, they alert irrigation districts, farmers, and other water users to possible water shortages and develop appropriate water conservation measures.

Soil conservationists also work as technical advisors to Soil and Water Conservation Districts, which are legal subdivisions of State governments concerned with, and responsible for, conservation problems within a county or other area. Soil conservationists map areas with soil and water conservation problems and help landowners plan and develop conservation programs. These problem areas may include only a few farms and ranches or an entire watershed.

## Working Conditions

Soil conservationists do most of their work in the field. When the weather is bad, they usually work in their offices, but occasionally

Soil conservationists mapping soil types.

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they have to work outdoors in inclement weather.

As is the case with other conservation workers, a large part of the soil conservationist's job involves working with other people. For example, they work with farmers, ranchers, and other land managers in developing conservation programs for their landholdings. When developing a conservation program for a large area, such as a conservation district, soil conservationists may confer with other conservation workers, as well as representative landowners and other concerned persons.

## Employment

An estimated 5,000 soil conservationists were employed in 1980, mostly by the Federal Government in the Department of Agriculture's Soil Conservation Service or in the Department of the Interior's Bureau of Indian Affairs. Soil conservationists employed by the Department of Agriculture work with Soil and Water Conservation Districts in almost every county in the country. Those employed by the Bureau of Indian Affairs generally work near or on Indian reservations, most of which are located in the Western States. Others are employed by State and local governments, and some teach at colleges and universities.

Some soil conservationists are employed by rural banks, insurance firms, and mortgage companies that make loans for agricultural lands. A few also work for public utilities and lumber and paper companies that have large holdings of forested lands.

## Training, Other Qualifications, and Advancement

Very few colleges and universities offer degrees with a major in soil conservation. Most soil conservationists have degrees in agronomy, agricultural education, or general agriculture; a few have degrees in related fields such as wildlife biology, forestry, and range management. Programs of study generally include 30 semester hours in natural resources or agriculture, including at least 3 hours in soils.

A knowledge of agricultural engineering is very helpful to soil conservationists, and so are courses in cartography, or mapmaking. Soil conservationists must be able to communicate well since much of their work consists of assisting farmers and ranchers in planning and applying sound conservation practices. Also, they must be able to prepare written reports and plans of programs to present to farmers, range managers, and Soil and Water Conservation Districts.

Opportunities for advancement are somewhat limited. However, conservationists working at the county level may advance to the area and State level. Also, soil conservationists can transfer to related occupations such as farm management advisors or land appraisers. Those with advanced degrees may find teaching opportunities in colleges and universities.

## Job Outlook

Employment of soil conservationists is expected to change little through the 1980's. Most openings will occur from the need to replace conservationists who retire, die, or transfer to other occupations.

Little change is expected in the number of soil conservationists employed by the Federal government, which is the largest employer of conservationists. However increased employment may occur in banks, public utilities, and other organizations that make loans on agricultural lands or that have large holdings of farm or ranchlands. In addition, as concern for the environment and interest in conserving the productivity of agricultural lands increase, a larger number of colleges may add soil conservation majors to their degree programs, which would increase the demand for soil conservationists to fill teaching positions.

## Earnings

Soil conservationists who had a bachelor's degree and were employed by the Federal Government started at $12,266 a year in early 1981. Those who had outstanding records in college, or who had a master's degree, started at $15,193 and could advance to $18,585 after 1 year. Soil conservationists with the Federal Government averaged about $24,300 in 1980.

## Related Occupations

Other workers who use science to help conserve and protect our natural resources include animal scientists, agronomists, aquatic biologists, agricultural engineers, foresters, geneticists, horticulturists, plant pathologists, range managers, soil scientists, and wood technologists.

## Sources of Additonal Information

Additional information on employment as a soil conservationist may be obtained from:

U.S. Department of Agriculture, Soil Conservation Service, P.O. Box 2890, Washington, D.C. 20013.

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# Social Scientists, Social Workers, Religious Workers, and Lawyers

Many of the workers described in this section of the *Handbook* are concerned with the social needs of people. For example, clinical psychologists help the mentally or emotionally disturbed adjust to life through behavior modification programs and other techniques. Social workers in a wide range of settings address the needs of individuals, families, groups, and communities. Their work may involve anything from helping an elderly person adjust to life in a nursing home to organizing fund raising for community social welfare activities. Recreation workers help people enjoy their nonworking hours by organizing activities in camps, community centers, playgrounds, and other settings. Religious workers counsel people in their faith and provide spiritual and moral leadership within their communities. Lawyers advise clients of their legal rights and obligations and suggest particular courses of action in personal and business matters.

People in these types of jobs must be tactful, compassionate, and sensitive to the needs of others. They must possess a manner that inspires trust and confidence. In fact, religious workers, lawyers, and others are bound by strict rules of ethics and may not disclose matters discussed in confidence with clients. Patience also is a vital personal characteristic as clients often are confused, hesitant, fearful, or angry. They may not fully understand their circumstances and may have difficulty expressing themselves.

Other workers described in this section conduct basic and applied research in the social sciences. They deal primarily with data and things rather than people. They use established methods to assemble a body of fact and theory that contributes to human knowledge. Social scientists study all aspects of human society—from an anthropologist studying the origins of the human race or a historian studying an ancient civilization to a political scientist analyzing the results of presidential elections or a market research analyst conducting a survey of consumer preferences. Through their studies and analyses, social scientists help educators, government officials, business executives, and others to address broad social, economic, and political questions.

The ability to think logically and methodically and to analyze data is essential to social science research. Other important personal characteristics include objectivity, openmindedness, and systematic work habits. Good oral and written communication skills also are necessary.

While training and educational requirements vary among the occupations in this cluster, advanced training leading to a doctoral or equivalent professional degree is often necessary for employment in certain settings and for "professional" recognition. Even in the case of occupations for which entry is possible with a bachelor's degree, for example, advancement prospects may be quite limited for those without graduate training. In terms of training requirements, these occupations demand a greater commitment than most occupations in the *Handbook*.

The *Handbook* statements that follow include more detailed information on the nature of the work, employment, and training requirements. Information on earnings, working conditions, and job outlook also is presented.

## Lawyers

(D.O.T. 110 and 090.227-010)

Laws affect every aspect of our society. They regulate the entire spectrum of relationships among individuals, groups, businesses, and governments. They define rights as well as restrictions, covering such diverse activities as judging and punishing criminals, granting patents, drawing up business contracts, paying taxes, settling labor disputes, constructing buildings, and administering wills.

Because social needs and attitudes are continually changing, the legal system that regulates our social, political, and economic relationships also changes. Lawyers, also called attorneys, link the legal system and society. To perform this role, they must understand the world around them and be sensitive to the numerous aspects of society that the law touches. They must comprehend not only the words of a particular statute, but the human circumstances it addresses as well.

As our laws grow more complex, the work of lawyers takes on broader significance. Laws affect our lives in new ways as the legal system takes on regulatory tasks in areas such as transportation, energy conservation, consumer protection, and social welfare. Lawyers interpret these laws, rulings, and regulations for individuals and businesses.

### Nature of the Work

In our society, lawyers act as both advocates and advisors. As advocates, they represent opposing parties in criminal and civil trials by presenting arguments that support their side in a court of law. As advisors, lawyers counsel their clients as to their legal rights and obligations and suggest particular

Most lawyers practice privately, either in law firms or in solo practice.

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courses of action in business and personal matters.

Whether acting as advocates or advisors, nearly all attorneys have certain activities in common. Probably the most fundamental activities are the interpretation of the law and its application to a specific situation. This requires in-depth research into the purposes behind certain laws and into judicial decisions that have applied those laws to circumstances similar to those currently faced by the attorney. Based on this research, the attorney decides what action would best serve the interests of the client.

Lawyers must deal with people in a courteous, efficient manner and not disclose matters discussed in confidence with clients. Because lawyers hold positions of great responsibility, they must always adhere to strict rules of ethics.

Finally, most lawyers write reports or briefs which must communicate clearly and precisely. The more detailed aspects of a lawyer's job depend upon his or her field and position.

While all licensed attorneys are allowed to represent parties in court, some appear in court more frequently than others. A few lawyers specialize in trial work. These lawyers usually have an exceptional ability to think quickly, speak with ease and authority, and are thoroughly familiar with courtroom strategy. Trial lawyers still spend considerable time outside the courtroom conducting research, interviewing clients and witnesses, and handling other details in preparation for trial.

Although some lawyers deal with many different areas of the law, a significant number specialize in one branch of law, such as admiralty, probate, or international law. Communications lawyers, for example, may represent radio and television stations in their dealings with the Federal Communications Commission (FCC). They help established stations prepare and file license renewal applications, employment reports, and other documents required by the FCC on a regular basis. They also keep their clients informed of changes in FCC regulations. Communications lawyers help individuals or corporations buy or sell a station or establish a new one.

Lawyers who represent public utilities before the Federal Power Commission and other regulatory agencies handle matters involving utility rates. They develop strategy, arguments, and testimony; prepare cases for presentation; and argue the case. These lawyers also inform clients about changes in regulations and give advice about the legality of their actions.

Still other lawyers advise insurance companies about the legality of insurance transactions. They write insurance policies to conform with the law and to protect companies from unwarranted claims. They review claims filed against insurance companies and represent companies in court.

Private practitioners specializing in other areas deal with wills, trusts, contracts, mortgages, titles, and leases. Some manage a person's property as trustee or see that provisions of a client's will are carried out as executor. An increasing number handle only public interest cases—civil or criminal—which have a potential impact extending well beyond the individual client. Attorneys hope to use these cases as a vehicle for legal and social reform.

A single client may employ a lawyer full time. Known as house counsel, this lawyer usually advises a company about legal questions that arise from business activities. Such questions might involve patents, government regulations, a business contract with another company, or a collective bargaining agreement with a union.

Attorneys employed at the various levels of government constitute still another category. Criminal lawyers may work for the State attorney general, a prosecutor or public defender, or the court itself. At the Federal level, attorneys may investigate cases for the Justice Department or other agencies. Lawyers at every government level help develop laws and programs; draft legislation; establish enforcement procedures; and argue cases.

Other lawyers work for legal aid societies—private, nonprofit corporations established to serve poor people in particular areas. These lawyers generally handle civil rather than criminal cases.

A relatively small number of attorneys work in law schools. Most are faculty members who specialize in one or more subjects, while others serve as administrators. Some work full time in nonacademic settings and teach part time. (For additional information, see the statement on college and university faculty elsewhere in the *Handbook*.)

Some attorneys use their legal background in administrative or managerial positions in various departments of large corporations. A transfer from a corporation's legal department to another department often is viewed as a way to gain administrative experience and rise in the ranks of management.

People may use their legal background as journalists, management consultants, financial analysts, insurance claim adjusters, real estate appraisers, lobbyists, tax collectors, probation officers, and credit investigators. A legal background also is an asset for political office seekers.

## Working Conditions

Lawyers do most of their work in offices and courtrooms. They sometimes meet in clients' homes or places of business and, when necessary, in hospitals or prisons. They frequently travel to attend meetings, to gather evidence, and to appear before courts, legislative bodies, and other authorities.

Salaried lawyers in government and private firms generally have structured work schedules. Law teachers, however, whose schedules are more flexible, may divide their time among teaching, research, and administrative responsibilities. Independent lawyers may work irregular hours while conducting research, conferring with clients, or preparing briefs during nonoffice hours. Lawyers generally work long hours and are under particularly heavy pressure when a case is being tried. Preparation for court includes keeping abreast of the latest laws and judicial decisions.

Although work generally is not seasonal, the work of tax lawyers may be an exception. Since lawyers in private practice can determine their own workload, many stay in practice well beyond the usual retirement age.

## Employment

About 425,000 persons worked as lawyers in 1980. About three-fourths of them practiced privately, either in law firms or in solo practices. Most of the remaining lawyers held positions in Federal, State, or local government. Although lawyers are concentrated in the Departments of Justice, Treasury, and Defense, they work for many other Federal agencies. Others are employed as house counsel by public utilities, transportation firms, banks, insurance companies, real estate agencies, manufacturing firms, welfare and religious organizations, and other business firms and nonprofit organizations. Over 8,000 lawyers taught full or part time in law schools. Some salaried lawyers also have independent practices; others do legal work part time while in another occupation.

## Training, Other Qualifications, and Advancement

To practice law in the courts of any State, a person must be admitted to its bar. Applicants for admission to the bar must pass a written examination; however, a few States drop this requirement for graduates of their own law schools. Lawyers who have been admitted to the bar in one State occasionally may be admitted in another State without taking an examination if they meet that State's standards of good moral character and have a specified period of legal experience. Federal courts and agencies set their own qualifications for those practicing before them.

To qualify for the bar examination in most States, an applicant must complete at least 3 years of college and graduate from a law school approved by the American Bar Association (ABA) or the proper State authorities. (ABA approval signifies that the law school meets certain standards developed by the association to promote quality legal education. With certain exceptions, graduates of nonapproved schools generally are restricted to taking the bar examination and practicing in the State in which the school is located.) A few States accept the study of law in a law office or in combination with study in a law school; only California accepts the study of law by correspondence as qualification for taking the bar exam. Several States require registration and approval of students by the State Board of Examiners, either before they enter law school or during the early years of legal study.

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Although there is no nationwide bar exam, 44 States and the District of Columbia participate in the Multistate Bar Examination (MBE). The MBE, covering issues of broad interest since the early 1970's, is given in addition to the State bar exam. States vary in their treatment of MBE scores.

The required college and law school education usually takes 7 years of full-time study after high school—4 years of undergraduate study followed by 3 years in law school. Although some law schools accept a very small number of students after 3 years of college, most require applicants to have a bachelor's degree. To meet the needs of students who can attend only part time, a number of law schools have night or part-time divisions which usually require 4 years of study. In 1979, about one-eighth of all graduates of ABA-approved schools were part-time students.

Competition for admission to law school is intense. Enrollments rose very rapidly during the early 1970's, with applicants far outnumbering available seats. Competition for admission remains stiff, especially in more prestigious law schools. Although enrollments are expected to level off during the 1980's, admission to law school will remain the first of several hurdles for prospective lawyers.

Preparation for a career as a lawyer really begins in college. Although there is no recommended "prelaw" major, the choice of undergraduate program is important. Certain courses and activities are desirable because they give the student the skills needed to succeed both in law school and in the profession. Essential skills—the ability to write, to read and analyze, to think logically, and to communicate verbally—are learned during high school and college. An undergraduate program that cultivates these skills while broadening the student's view of the world is best. Majors in the social sciences, natural sciences, and humanities all are suitable, although a student should not specialize too narrowly. Regardless of one's major, courses in English, foreign language, public speaking, government, philosophy, history, economics, and mathematics, among others, are highly recommended.

Students interested in a particular aspect of law may find related courses helpful; for example, engineering and science courses for the prospective patent attorney, and accounting for the future tax lawyer. In addition, typing is advisable simply for convenience in law school.

Acceptance by most law schools depends on the applicant's ability to demonstrate an aptitude for the study of law, usually through good grades and the Law School Admission Test (LSAT), administered by the Educational Testing Service. In 1980, the American Bar Association had approved 170 law schools. Others were approved by State authorities only.

During the first year or year and a half of law school, students generally study fundamental courses such as constitutional law, contracts, property law, and judicial procedures. In the remaining time, they may elect specialized courses in fields such as tax, labor, or corporation law. Practical experience often is acquired by participation in school-sponsored legal aid or legal clinic activities, in the school's moot court competition in which students conduct practice trials under the supervision of experienced lawyers and judges, and through writing on legal issues for the school's law journal.

A number of law schools have clinical programs where students gain legal experience through practice trials and law school projects under the supervision of practicing lawyers and law school faculty. Law school clinical programs might include work in legal aid clinics, for example, or on the staff of legislative committees. Part-time or summer clerkships in law firms, government agencies, and corporate legal departments also provide experience that can be extremely valuable later on. Such training can provide references or lead directly to a job after graduation, and can help students decide what kind of practice best suits them. Clerkships also may be an important source of financial aid.

Graduates receive the degree of *juris doctor* (J.D.) or *bachelor of law* (LL.B.) as the first professional degree. Advanced law degrees are desirable for those planning to specialize, do research, or teach. Some law students pursue joint degree programs, which generally require an additional year or more. Joint degree programs are offered in a number of areas, including law and business administration, law and public administration, and law and social work.

After graduation, lawyers must keep informed about legal and nonlegal developments that affect their practice. An attorney representing electronics manufacturers, for example, must follow trade journals and the latest Federal regulations. Attorneys in the State Department must remain well versed in current events and international law, while divorce lawyers read about the changing role of the family in modern society. Many law schools and State and local bar associations provide continuing education courses that help lawyers stay abreast of recent developments.

The practice of law involves a great deal of responsibility. Persons planning careers in law should like to work with people and be able to win the respect and confidence of their clients, associates, and the public. Integrity and honesty are vital personal qualities. Intellectual capacity and reasoning ability are essential to analyze complex cases and reach sound conclusions. At times, lawyers need creativity when handling new and unique legal problems.

Most beginning lawyers start in salaried positions. Newly hired salaried attorneys usually act as research assistants to experienced lawyers or judges. After several years of progressively responsible salaried employment, many lawyers go into practice for themselves. Some lawyers, after years of practice, become judges.

## Job Outlook

Employment of lawyers grew very rapidly during the late 1970's. Faster-than-average growth is expected to continue through the 1980's as increased population, business activity, and government regulation help sustain the strong demand for attorneys. This demand also will be spurred by the growth of legal action in such areas as consumer protection, the environment, and safety, and an anticipated increase in the use of legal services by middle-income groups through prepaid legal service programs. As colleges and universities add law courses to their liberal arts, business, and other curriculums, additional lawyers may be needed to teach part time. Most jobs, however, will be created by the need to replace lawyers who die, retire, or leave the occupation for other reasons.

Despite strong growth in the demand for lawyers, the sizable number of law school graduates entering the job market each year has created keen competition for jobs. While the number of graduates is expected to level off during the 1980's, competition for jobs will remain intense.

Employers will continue to be selective in hiring new lawyers. Graduates of prestigious law schools and those who rank high in their classes should find salaried positions with law firms, on the legal staffs of corporations and government agencies, or as law clerks for judges. Graduates of less prominent schools and those with lower scholastic ratings will experience some difficulty in finding salaried jobs. Some graduates may be forced to accept positions for which they are overqualified or in areas outside their field of interest. An increasing proportion will enter fields where legal training is an asset but not normally a requirement. For example, banks, insurance firms, real estate companies, government agencies, and other organizations seek law graduates to fill many administrative, managerial and business positions.

Due to the competition for jobs, a law graduate's geographic mobility and experience assume greater importance. The willingness to relocate may be an advantage in getting a job. In addition, employers increasingly seek graduates who have advanced law degrees and experience in a particular field such as tax, patent, or admiralty law.

Establishing a new practice probably will continue to be best in small towns and expanding suburban areas, as long as an active market for legal services already exists. In such communities, competition is likely to be less than in big cities and new lawyers may find it easier to become known to potential clients; also, rent and other business costs are somewhat lower. Nevertheless, starting a new practice will remain an expensive and risky proposition that should be weighed carefully. Salaried positions will continue largely in urban areas where government

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agencies, law firms, and big corporations are concentrated.

Some lawyers are adversely affected by cyclical swings in the economy. During recessions, the demand for some discretionary legal services, such as planning estates, drafting wills, and handling real estate transactions, declines. Also, corporations are less likely to litigate cases when declining sales and profits result in budgetary restrictions. Although few lawyers actually lose their jobs during these times, earnings may decline for many. Some corporations and law firms will not hire new attorneys until business improves. Several factors, however, mitigate the overall impact of recessions on lawyers. During recessions, individuals and corporations face other legal problems, such as bankruptcies and foreclosures, that require legal action. Furthermore, the continuous emergence of new laws and legal interpretations will create new opportunities for lawyers.

## Earnings

In 1980, starting salaries for recent law school graduates ranged from $10,000 a year in some small firms to over $35,000 in some larger ones. Beginning attorneys in private industry averaged around $21,000. In the Federal Government, annual starting salaries for attorneys in early 1981 were about $18,600 or $22,500, depending upon academic and personal qualifications. Factors affecting the salaries offered to new graduates include: Academic record; type, size, and location of employers; and the desired specialized educational background. The field of law makes a difference, too. Patent lawyers, for example, generally are among the highest paid attorneys.

Salaries of experienced attorneys also vary widely according to the type, size, and location of the employers. The average salary of the most experienced lawyers in private industry in 1980 was over $60,000. General attorneys in the Federal Government averaged around $35,000 a year in 1980; the relatively small number of patent attorneys in the Federal Government averaged around $43,100.

Lawyers starting their own practice may need to work part time in other occupations during the first years to supplement their income. Lawyers on salary receive increases as they assume greater responsibility. Incomes of lawyers in practice usually grow as their practices develop. Private practitioners who are partners in law firms generally earn more than those who practice alone.

## Related Occupations

Legal training is invaluable in many other occupations. Some of these are abstractors, arbitrators, conciliators, hearing officers, patent agents, title examiners, legislative assistants, and FBI special agents.

## Sources of Additional Information

Persons considering law as a career will find information on law schools and prelaw study in the *Prelaw Handbook*, published annually (Law School Admission Services, Box 944, Princeton, N.J. 08540). Copies may be available in public or school libraries. In addition, many colleges and universities have a prelaw advisor who counsels undergraduates about their course work, the LSAT, law school applications, and other matters.

Information on law schools, financial aid for law students, and law as a career is available from:

Information Services, American Bar Association, 1155 East 60th St., Chicago, Ill. 60637. (There may be a slight charge for publications.)

For information on the placement of law graduates and the legal profession in general, contact:

National Association for Law Placement, Boston University School of Law, 207 Bay State Rd., Boston, Mass. 02215.

Information on legal education is available from:

Association of American Law Schools, 1 Dupont Circle NW., Suite 370, Washington, D.C.20036.

For advice on financial aid, contact a law school financial aid officer.

The specific requirements for admission to the bar in a particular State may be obtained at the State capital from the clerk of the Supreme Court or the Secretary of the Board of Bar Examiners.

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# Social Scientists and Urban Planners

Social scientists study all aspects of human society—from the fossilized remains of prehistoric life to newly formed religious groups or plans for modern mass transportation systems. Social science research provides insights that help us understand the many different ways in which individuals and groups make decisions, exercise power, or respond to change. Through their studies and analyses, social scientists and urban planners assist educators, government officials, business leaders, and others to solve social, economic, and environmental problems.

Depending on their jobs, social scientists and urban planners may need a wide range of personal characteristics. Because they constantly seek new information about people, things, and ideas, intellectual curiosity and creativity are two fundamental personal traits. The ability to think logically and methodically is important to a political scientist analyzing the differences between dictators and leaders of democratic governments. The ability to analyze data is important to an economist studying proposals for tax reform. Objectivity, open-mindedness, and systematic work habits are important in all kinds of social science research. Perseverance is essential for an anthropologist who might spend years accumulating artifacts from an ancient civilization. Emotional stability and sensitivity are vital to a clinical psychologist working with mental patients. And, of course, written and oral communication skills are essential to all these workers.

Research is a basic activity for many social scientists. They use established methods to assemble a body of fact and theory that contributes to human knowledge. Applied research usually is designed to produce information that will enable people to make better decisions or manage their affairs more effectively. Surveys are widely used to collect facts, opinions, or other information. Data collection takes many other forms, however, including excavations at an archeological "dig;" the analysis of historical records and documents; experiments with human subjects or lower animals in a psychological laboratory; and the administration of standardized tests and questionnaires.

Statistics is becoming an essential part of the training for most social scientists. Mathematics is also very important. Indeed, the widespread introduction of mathematical and other quantitative research methods in economics, political science, market research, experimental psychology, and other fields is among the most important changes in recent times. The ability to use computers for research purposes is a "must" in many disciplines.

Regardless of their field of specialization, social scientists are concerned with some aspect of society, culture, or personality. *Anthropologists* study the relics and ruins of ancient civilizations, analyze human physical characteristics, and compare the customs, values, and social patterns of different cultures. *Economists* study the way we use our resources to produce goods and services. They compile and analyze data that explain the costs and benefits of allocating resources in different ways. *Historians* describe and interpret the people, ideas, institutions, and events of the past and present. *Political scientists* investigate the ways in which political power is amassed and used. Studying topics such as public opinion, political decision-making, and ideology, they analyze the structure and operation of governments and examine informal political entities as well. *Psychologists* study human behavior and use their expertise to counsel or advise individuals or groups. Their research also assists advertisers, politicians, and others interested in influencing or motivating people. *Sociologists* analyze the behavior of groups or social systems such as families, neighborhoods, or clubs.

*Market research analysts* conduct surveys to determine public preferences for a wide variety of products and services. The results of their research are used by business, industry, and government in formulating policy. *Urban and regional planners* develop comprehensive plans and programs for the use of land for industrial and public sites.

Besides the occupations described in this section, a number of related fields are covered elsewhere in the *Handbook*. See the statements on lawyers, city managers, statisticians, mathematicians, programmers, systems analysts, reporters and correspondents, social workers, college and university faculty, college student personnel workers, and counseling occupations classified under teachers, librarians, and counselors.

The Ph.D. is a minimum requirement for most positions in colleges and universities and is important for advancement to many top level nonacademic posts. Graduates with master's degrees have more limited professional opportunities, although the situation varies a great deal by field. For example, job prospects for master's degree holders in urban and regional planning are much brighter than for master's degree holders in history. Bachelor's degree holders have even more limited opportunities and in most social science occupations do not qualify for "professional" positions. The bachelor's degree does, however, provide a suitable background for many different kinds of "junior professional" jobs, such as research assistant, administrative aide, or management trainee.

An estimated 264,000 persons were employed as social scientists and urban planners in 1980. The interdisciplinary nature of the various fields makes it difficult to determine the exact size of each profession. Psychology and economics are the largest fields; anthropology is the smallest.

About one-third of these workers are employed by colleges and universities, where they characteristically combine teaching with research and consulting. The importance of the academic world as a source of employment varies widely by discipline, however. For example, a large proportion of urban and regional planners, market research analysts, and psychologists work in nonacademic jobs.

The predominance of academic employment in such disciplines as history and sociology may cause problems for these specialists during the 1980's as college enrollments decline. Compared to the past, few academic positions will be available, and efforts are underway to acquaint new graduates in these fields with alternative or nontraditional career opportunities in areas such as program administration and evaluation. Such positions are available in Federal, State, and local government agencies; research organizations and consulting firms; hospitals and other health facilities; and labor unions, trade associations, nonprofit organizations, and business firms.

The number of advanced degrees awarded in the social sciences through the 1980's is expected to exceed job openings and produce a highly competitive outlook for professional positions traditionally requiring a doctorate. Job prospects are better in some disciplines than in others. As in the past, top graduates of leading universities will have a decided advantage in competing for jobs, especially for the limited number of academic jobs. Other considerations that affect employment opportunities in these occupations include degree level; field of specialization; specific skills and experience; desired work setting; salary requirements; and geographic mobility. More detailed information about the job outlook in these individual occupations appears in the following statements.

## Anthropologists

(D.O.T. 055.067 and 090.227-010)

### Nature of the Work

Anthropologists study people—their evolution and physical characteristics, and the cultures they create. The domain is broad; anthropologists study people's traditions, beliefs, customs, languages, material possessions, social relationships, and value systems. They generally concentrate in one of four

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Cleaning a specimen from a tar pit is painstaking work.

subfields: Cultural anthropology, archeology, linguistics, or physical anthropology.

Most anthropologists specialize in cultural anthropology, sometimes called ethnology. They study the customs, culture, and social life of groups, and may spend months or years living with a group to learn about its way of life. These cultural anthropologists may learn another language while observing and studying a group. Ethnographic research may focus on a particular institution or aspect of group life such as kinship, personality, art, law, religion, economics, or ecological adaptation. The field lends itself to comparative studies, such as those on different societies' attitudes towards old age. In recent years, anthropologists have ventured beyond their traditional concern with nonindustrialized societies. More and more, their research deals with groups found in modern urban societies: Ghetto inhabitants, drug addicts, politicians, and business leaders, for example.

*Archeologists* study cultures from artifacts and other remains in the ground. Using scientific techniques for dating and analyzing everything they find, archeologists gather and examine the remains of homes, tools, clothing, ornaments, and other evidences of human life and activity to reconstruct the inhabitants' history and customs. Their work requires extensive knowledge of earth science, geology, biology, and paleontology (the study of fossil remains). Archeological fieldwork takes place wherever people have once lived. Sites in all parts of the world span many centuries—from ancient times up to the present. For example, extensive excavations have provided clues about the social and economic life of ancient Greek, Roman, and Middle Eastern civilizations. In recent years, support has grown for archeological study of relatively modern communities—American colonial settlements and 19th century industrial towns, for example.

*Linguistic anthropologists* study the role of language in various cultures. They examine and relate the sounds and structure of a society's language to people's behavior and thought patterns. Their research tells us, for example, that the way people use language may influence the way they think about things.

*Physical anthropologists* are concerned with humans as biological organisms. They study the evolution of the human body and look for the earliest evidence of human life. They also study the effect of heredity and environment on different populations. Their work requires extensive training in anatomy, biology, chemistry, genetics, and the study of primates (the order of mammals that includes humans, apes, and monkeys). A physical anthropologist might study children's growth and development or investigate the relationship between diet and health. A knowledge of body structure enables these anthropologists to work as consultants on projects as diverse as the design of military equipment and the sizing of clothing. *Anthropometrists* specialize in the measurement of the body or skeleton.

Anthropologists, like other social scientists, are research-oriented. Most, however, combine fieldwork or other forms of anthropological research with other activities: Teaching, writing, consulting, or administering programs. Moreover, a growing number of anthropologists specialize in *applied anthropology*; they concern themselves first and foremost with practical applications for research findings. *Medical anthropologists*, for example, may study cultural attitudes towards medicine and health care to help formulate a health program for a particular group. Some medical schools hire medical anthropologists as instructors. *Urban anthropologists* study complex, industrialized societies and examine the influence of city life upon people and their institutions. Some work with architects, designers, and land use experts in planning community development projects. Others advise social service agencies; their cross-cultural insights enable them to help improve the delivery of health, counseling, nutritional, and other services to particular population groups. Still other anthropologists use their knowledge of ethnic customs and values to help educators improve the effectiveness of classroom teaching and increase parental involvement. The advice of anthropologists has been sought in the planning of bilingual education programs, for example.

Preparing cultural environmental impact statements is an increasingly important activity for anthropologists, as it is for other social scientists. In many communities, environmental protection and historic preservation laws require local authorities to identify historic areas which may be affected by development

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or renovation plans. Typically, those proposing to construct a new building or demolish an old one are required to suggest ways of avoiding or lessening any adverse impacts on the environment. Generally, the research and writing involved in preparing an impact statement are done on a consultant basis by anthropologists associated with museums, colleges and universities, research institutes, or private consulting firms. In some cases, anthropologists are hired by highway commissions or planning departments to prepare impact statements.

## Working Conditions

Dividing their time among teaching, research, and administration, anthropologists employed by colleges and universities have flexible work schedules. On the other hand, anthropologists working in government agencies and private firms have much more structured work schedules. Anthropologists often work alone behind a desk—reading, analyzing data, and writing up the results of their research. Many experience the pressures of deadlines, tight schedules, and heavy workloads, and sometimes must work overtime. Numerous telephone calls, letters, special requests for information, meetings, or conferences may interrupt their routine.

When anthropologists participate in field research, working conditions differ, for they are an integral part of a research team. Fieldwork may require traveling to remote areas, working under adverse weather conditions, living in primitive housing, and adjusting to different cultural environments. Physical stamina is important because anthropologists doing fieldwork may have to lift equipment, walk considerable distances, and spend long hours digging.

## Employment

An estimated 7,200 persons worked as anthropologists in 1980. About 4 out of 5 anthropologists work in colleges and universities, where they teach and do research and consulting work. (More detailed information may be found in the *Handbook* statemen' on college and university faculty.)

The Federal Government employs several hundred anthropologists, chiefly in the Departments of Interior, State, Agriculture, and the Army, and in the Smithsonian Institution. Anthropologists who work for State and local governments are primarily involved in community development planning, health planning, archeological research, and historic preservation. A number of them have administrative jobs in museums.

Some anthropologists work for consulting firms or operate their own consulting services. They conduct research and prepare proposals for government agencies, community organizations, citizens' groups, and business firms. Some consultants specialize in overseas development projects.

## Training, Other Qualifications, and Advancement

Persons who want to become anthropologists should obtain the Ph.D. degree. College graduates often get temporary positions and assistantships to work on advanced degrees. A master's degree, plus field experience, is sufficient for many beginning professional positions, but promotion to top positions generally is reserved for individuals who have a Ph.D. degree. Colleges and universities require a Ph.D. for permanent teaching appointments. Persons with a master's or bachelor's degree in anthropology may qualify for research and administrative positions in government and private firms.

A student interested in anthropology should have a broad background in the social and physical sciences and in languages. Those planning to become physical anthropologists should concentrate on biological sciences. Aspiring archeologists should supplement their studies with courses in the physical sciences. Cultural anthropology, on the other hand, requires more courses in social science and the humanities. Mathematics, statistics, and computer science are increasingly important research tools. Undergraduates may begin their field training in archeology by arranging, through their university departments, to accompany expeditions as laborers or to attend field schools established for training. They may later become supervisors in charge of the digging or collection of material and finally may direct a portion of the work of the expedition. Ethnologists and linguists usually do fieldwork independently. Because most anthropologists base doctoral dissertations on data collected through research, they are experienced fieldworkers by the time they earn the Ph.D. degree.

The Federal Government generally requires a college degree with 24 semester hours in anthropology for entry level positions as anthropologists and 20 semester hours in anthropology, including one course in American archeology, for archeologists. However, because competition for Federal jobs is keen, additional education or experience may be required.

Over 300 colleges and universities have bachelor's degree programs in anthropology; some 160 offer master's degree programs and about 90, doctoral programs. The choice of a graduate school is very important. Students interested in museum work should select a school associated with a museum that has anthropological collections. Similarly, those interested in archeology either should choose a university that offers opportunities for summer experience in fieldwork or attend an archeological field school elsewhere during summer vacations.

Interdisciplinary studies are an important part of an anthropologist's professional training, for anthropology embraces all aspects of life and overlaps many other disciplines, each with its own tradition and body of knowledge. To bring anthropological insights to bear on projects centered in another discipline—bilingual education is a good example—anthropologists may have to learn theory and techniques from another field. For this reason, some departments of anthropology are combined with other departments such as sociology or geography.

Some anthropology students broaden their employment possibilities by pursuing courses or degrees in other areas including law, medicine, public administration, and education.

Anthropologists should have a special interest in natural history and social studies and enjoy reading, research, and writing. Creativity and intellectual curiosity are essential to success in this field. In addition, anthropologists must be objective and systematic in their work. Perseverance is essential, particularly for archeologists who may spend years accumulating and piecing together artifacts from ancient civilizations. Archeological fieldwork also may require manual dexterity, as well as the ability to analyze data and think logically. Anthropologists must speak and write well to communicate the results of their work effectively.

## Job Outlook

Employment of anthropologists is expected to increase about as fast as the average for all occupations through the 1980's. However, nearly all growth will occur in nonacademic jobs—notably in consulting firms, research institutes, corporations, and Federal, State, and local government agencies. Among the factors contributing to this growth is environmental, historic, and cultural resource preservation legislation. This legislation has increased the demand for anthropologists to write environmental impact statements. During the mid-1970's, rapid growth in this demand resulted in a shortage of trained archeologists. Those who had no more than a master's degree were being hired to work full time or on a temporary contract basis for consulting firms, government agencies, academic institutions, and museums. However, as more anthropologists have sought work in the fields of environmental protection and historic preservation, the Ph.D. is increasingly required. Growing interest in ethnic studies may spur demand for anthropological research in that area as well.

College and university teaching will remain the largest area of employment for anthropologists. The basic determinant of demand for college faculty is enrollment. College enrollments are expected to decline during the 1980's. This almost certainly would mean no growth and perhaps even some decrease in employment of college faculty over the period.

The number of qualified anthropologists seeking to enter the field is expected to exceed available positions. As a result, doctorate holders may face keen competition through the 1980's, particularly in colleges and universities. Some are expected to accept

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temporary appointments with little hope of tenure. Graduates with master's degrees are expected to face very keen competition, although some may find jobs in junior colleges and government and private agencies. Bachelor's degree holders who find jobs as anthropologists may have very limited advancement opportunities. Some teaching positions may be available in high schools for those who meet State certification requirements.

Overall, specialties offering the best employment prospects include archeology and physical, medical, and urban anthropology.

## Earnings

The results of a 1980 American Anthropological Association survey of departments of anthropology included data on faculty salaries. The average beginning salary for new faculty members without full-time teaching experience ranged from about $15,600 to $19,500 for persons with a Ph.D., and from $13,500 to $14,500 for persons without a Ph.D. Faculty salaries varied widely but generally were lower in departments granting only bachelor's degrees than in departments granting graduate degrees. Most professors earned from $20,000 to over $30,000 a year; associate professors, $18,000 to $30,000; assistant professors, $15,000 to $27,000; and instructors, $12,000 to $18,000.

The Federal Government recognizes education and experience in certifying applicants for entry level positions. Anthropologists having a bachelor's degree could begin at about $12,300 or $15,200 a year in early 1981, depending upon the applicant's academic record and experience. The starting salary for those having a master's degree generally was $18,600 a year; for those having a Ph.D., $22,500. Anthropologists in the Federal Government averaged around $34,800 a year in 1980; archeologists, around $20,600.

Many anthropologists in colleges and universities supplement their regular salaries with earnings from other sources such as summer teaching, research grants, and consulting fees.

## Related Occupations

Like anthropologists, people in several other occupations are concerned with understanding how social institutions operate. Among them are economists, geographers, historians, political scientists, psychologists, sociologists, urban planners, market research analysts, and newspaper reporters.

Knowledge of physical, environmental, and biological science often is important to anthropologists. Others whose work requires training in one or more of these fields include geologists, geophysicists, meteorologists, oceanographers, astronomers, chemists, physicists, biochemists, life scientists, and soil scientists.

## Sources of Additional Information

For information about careers (including opportunities for contract work in archeology and historic preservation and State employment opportunities for archeologists); job openings; grants and fellowships; and schools that offer training in anthropology, contact:

The American Anthropological Association and the Society for American Archeology, 1703 New Hampshire Ave. NW., Washington, D.C. 20009.

For information on careers and fieldwork opportunities in archeology, contact:

The Archeological Institute of America, 53 Park Place, New York, N.Y. 10007.

# Economists

(D.O.T. 050 and 090.227-010)

## Nature of the Work

Economists study the way a society uses scarce resources such as land, labor, raw materials, and machinery to provide goods and services. They analyze the results of their research to determine the costs and benefits of making, distributing, and using resources in a particular way. Their research might focus on topics such as energy costs, inflation, business cycles, unemployment, tax policy, or farm prices.

Some economists who are primarily theoreticians may develop theories through the use of mathematical models to explain the causes of inflation. Most economists, however, are concerned with practical applications of economic policy in a particular area, such as finance, labor, agriculture, transportation, energy, or health. They use their understanding of economic relationships to advise business firms, insurance companies, banks, securities firms, industry associations, labor, government, unions, and others.

Depending on the topic under study, economists may devise methods and procedures for obtaining data they need. For example, sampling techniques may be used to conduct a survey, and econometric modeling techniques may be used to develop projections. Preparing reports usually is an important part of the economist's job. He or she may be called upon to review and analyze all the relevant data, prepare tables and charts, and write up the results in clear, concise language.

Being able to present economic and statistical concepts in a meaningful way is particularly important for economists whose research is policy directed. Economists who work for business firms may be asked to provide management with information to make decisions on marketing and pricing of company products; to look at the advisability of adding new lines of merchandise, opening new branches, or diversifying the company's operations; to analyze the effect of changes in the tax laws; or to prepare economic and business forecasts. Business economists working for firms that carry on operations abroad may be asked to prepare forecasts of foreign economic conditions.

Economists who work for government agencies assess economic conditions in the United States and abroad and estimate the economic impact of specific changes in legislation or public policy. They study such questions as the effect on youth unemployment of changes in minimum wage legislation, for example. Most government economists are in the fields of agriculture, business, finance, labor, transportation, urban economics, or international trade. For example, economists in the U.S. Department of Commerce study domestic production, distribution, and consumption of commodities or services; those in the Federal Trade Commission prepare industry analyses to assist in enforcing Federal statutes designed to eliminate unfair, deceptive, or monopolistic practices in interstate commerce; and those in the Bureau of Labor Statistics analyze data on prices, wages, employment, and productivity.

Economists in colleges and universities teach the theories, principles, and methods of economics. In addition, economics faculty members conduct research, write, and engage in other nonteaching activities. They frequently are asked to serve as consultants to business firms, government agencies, and individuals. (For more information on jobs in colleges and universities, see the *Handbook* statement on college and university faculty.)

## Working Conditions

Economists employed by colleges and universities have flexible work schedules, dividing their time among teaching, research, and administrative responsibilities. Economists working for government agencies and private firms, on the other hand, have much more structured work schedules. They often work alone with only reports, statistical charts, computers, and calculators for company. Or they may be an integral part of a research team on some assigned projects. Most economists work under pressure of deadlines, tight schedules, and heavy workloads, and sometimes must work overtime. Their routine may be interrupted by telephone calls, letters, special requests for data, meetings, or conferences. Travel may be necessary to collect data or attend conferences.

## Employment

An estimated 44,000 persons worked as economists in 1980. More than one-third of all economists were employed in colleges and universities, while another one-third worked for government agencies, including a wide range of Federal agencies. Private industry, including manufacturing firms, banks, insurance companies, securities and investment companies, economic research firms, and management consulting firms, employed most of the remaining economists. Some economists run their own consulting businesses. A number of economists combine a full-time job in government, business, or an academic institution with part-time or consulting work in another setting.

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Economists work in all large cities and university towns. The largest numbers are in New York City and Washington, D.C. Some work abroad for companies with major international operations; for the Department of State and other U.S. Government agencies; and for international organizations.

## Training, Other Qualifications, and Advancement

Economists must thoroughly understand economic theory and mathematical methods of economic analysis. Since many beginning jobs in government and business involve the collection and compilation of data, a thorough knowledge of basic statistical procedures is required. In addition to courses in macroeconomics, microeconomics, econometrics, and business and economic statistics, training in computer science is highly recommended.

At the undergraduate level, courses in the following subjects also are valuable: Business cycles; economic and business history; economic development of selected areas; money and banking; international economics; public finance; industrial organization; labor economics; comparative economic systems; economics of national planning; urban economic problems and policies; marketing; consumer analysis; organizational behavior; and business law.

A bachelor's degree with a major in economics is sufficient for many beginning research, administrative, management trainee, and business sales jobs. However, graduate training increasingly is required for advancement to more responsible positions. Areas of specialization at the graduate level include advanced economic theory, comparative economic systems and planning, econometrics, economic development, economic history, environmental and natural resource economics, history of economic thought, industrial organization, institutional economics, international economics, labor economics, monetary economics, public finance, regional and urban economics, and social policy. Students should select graduate schools strong in specialties in which they are interested. Some schools help graduate students find internships or part-time employment in government agencies or economic research firms. Work experience and contacts can be useful in testing career preferences and learning how the job market for economists really works.

In the Federal Government, candidates for entrance positions generally need a college degree with a minimum of 21 semester hours of economics and 3 hours of statistics, accounting, or calculus. However, because competition is keen, additional education or experience may be required.

A master's degree generally is the minimum requirement for a job as a college instructor in many junior colleges and small 4-year schools. In some colleges and universities, however, a Ph.D. is necessary for appointment as a teaching assistant or instructor. The Ph.D. is required for a professorship and for tenure, which is becoming increasingly difficult to obtain.

Economists use diagrams and charts to explain their findings.

In government, industry, research organizations, and consulting firms, economists who have a graduate degree usually can qualify for more responsible research and administrative positions. A Ph.D. may be necessary for top positions in some organizations. Experienced economists may advance to managerial or executive positions in banks, industrial concerns, trade associations, and other organizations to formulate business and administrative policy.

About 1,600 colleges and universities offer bachelor's degree programs in economics; about 270, master's; and about 120, doctoral programs.

Persons who consider careers as economists should be able to work accurately with detail since much time is spent on data analysis. Patience and persistence are necessary because economists may spend long hours on independent study and problem solving. Sociability enables economists to work easily with others. Economists must be objective and systematic in their work and must be able to express themselves effectively both orally and in writing. Creativity and intellectual curiosity are essential to success in this field, just as they are in other areas of scientific endeavor.

## Job Outlook

Employment of economists is expected to grow faster than the average for all occupations through the 1980's. In addition to growth in demand for economists, many job openings will result from transfers, deaths, retirements, and other separations from the labor force.

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Overall, economists are likely to have more favorable job prospects than most other social scientists. Opportunities should be best for economists in business and industry, research organizations, and consulting firms, reflecting the complexity of the domestic and international economies and increased reliance on quantitative methods of analyzing business trends, forecasting sales, and planning purchases and production operations. Employers will seek economists well trained in econometrics and statistics.

The continued need for economic analyses by lawyers, accountants, engineers, health service administrators, urban and regional planners, and others will also increase the number of jobs for economists. Their employment in State and local government agencies is expected to increase in response to the heavy responsibilities of local authorities in housing, transportation, environment and natural resources, health, and employment development and training. Employment of economists in the Federal Government is expected to rise slowly—in line with the rate of growth projected for the Federal work force as a whole. Since college enrollments are expected to decline during the 1980's, little or no employment growth is expected in colleges and universities. As a result, many highly qualified economists will enter nonacademic positions.

Persons who graduate with a bachelor's degree in economics through the 1980's are likely to face keen competition. However, many will find employment in government, industry, and business as management or sales trainees, or as research or administrative assistants. Those with strong backgrounds in mathematics, statistics, and computer science may be hired by private firms for market research work. Candidates who hold master's degrees in economics face very strong competition for teaching positions in colleges and universities, although some may gain positions in junior and community colleges. However, they should find good opportunities for administrative, research, and planning positions in private industry and government. Those with a strong background in marketing and finance may have the best prospects in business. Ph.D.'s are likely to face competition for academic positions, although top graduates from leading universities should have little difficulty in acquiring teaching jobs. However, a larger number of Ph.D.'s will be forced to accept jobs at smaller, less prestigious institutions. Generalists who have a strong background in economic theory, mathematics, and statistics and who can teach an applied area are in greatest demand. Ph.D.'s should have favorable opportunities in government, industry, research organizations, and consulting firms.

Generally, a strong background in economic theory and econometrics provides the tools for acquiring any specialty within the field. Those skilled in quantitative techniques and their application to economic modeling and forecasting may have the best job opportunities.

## Earnings

According to an American Economic Association survey, average salaries of economists employed in college and university departments offering the Ph.D. degree were as follows in academic year 1979-80: Professors, about $34,100; associate professors, about $24,600; assistant professors, about $19,100; and instructors, about $16,100. Average salaries were lower in departments that offered only the master's or bachelor's degree.

The median base salary of business economists in 1980 was $38,000, according to a National Association of Business Economists survey. About one-half of the respondents reported additional compensation from primary employment while about one-third reported income from secondary employment. Economists in general administration and economic advisors commanded the highest salaries while econometricians and teachers had the lowest base salaries. By industry, the highest paid business economists were in the securities and investment and consulting fields; the lowest were in colleges and universities and real estate.

The Federal Government recognizes education and experience in certifying applicants for entry level positions. In general, the entrance salary for economists having a bachelor's degree was about $12,300 a year in early 1981; however, those with superior academic records could begin at about $15,200. Those having a master's degree could qualify for positions at an annual salary of about $18,600, while those with a Ph.D. could begin at about $22,500. Economists in the Federal Government averaged around $31,400 a year in 1980.

Based on a 1980 State government salary survey, average salaries for economists (positions requiring a bachelor's degree) ranged from about $14,100 to $19,300; for principal economists (positions requiring a master's degree and experience), from $20,500 to $27,600; and for chiefs of economic research (positions requiring a master's degree and extensive administrative or supervisory experience), from $25,200 to $33,500.

## Related Occupations

Economists are concerned with understanding and interpreting financial matters. Others with jobs in this area include financial analysts, bank officers, accountants and auditors, underwriters, actuaries, securities sales workers, appraisers, credit analysts, loan officers, and budget officers.

## Sources of Additional Information

For information on schools offering graduate training in economics, contact:

American Economic Association, 1313 21st Avenue South, Nashville, Tenn. 37212.

For additional information on careers in business economics, contact:

National Association of Business Economists, 28349 Chagrin Blvd., Suite 201, Cleveland, Ohio. 44122.

# Historians

(D.O.T. 052; 090.227-010; 101; 102.017-010; and 102.117-010)

## Nature of the Work

History is the record of past events, institutions, ideas, and people. Historians describe and analyze the past through writing, teaching, and research. They use standard techniques to locate and evaluate historical evidence. Historians do not accept documents, records, or spoken accounts at face value; they study each piece of evidence carefully to determine whether it is reliable or genuine. Once they have established the validity of historical evidence, historians try to determine the significance of their findings. Sometimes they develop theories to explain the importance of facts and their interrelationships. They may, for example, relate their knowledge of the past to current events in an effort to explain the present.

Historians almost always specialize. Some concentrate on the history of a country or a region; others study a particular period of time—the 20th century, for example. Although many historians in this country specialize in the social or political history of the United States or modern Europe, a growing number study African, Latin American, Asian, or Middle Eastern history. Some specialize in the history of a field, such as economics, medicine, philosophy, religion, science, technology, music, art, military affairs, or the labor movement. Other fields of specialization are genealogy, biography, rare books and documents, and historic preservation.

Most historians teach in colleges or universities. Like other faculty members, they may also lecture, write, and do consulting work. Some historians employed by colleges and universities do only research. (For more information on these jobs, see the statement on college and university faculty elsewhere in the *Handbook*.)

A growing number of historians do many things besides teach, however. *Archivists* and *Curators* work for museums, special libraries, or historical societies, where they typically identify, classify, and preserve historical documents, artifacts, objects, and other material. They may also help scholars use manuscripts and artifacts and educate the public through exhibits and publications. Many do extensive research and writing.

*Biographers* use diaries, news accounts, personal correspondence, interviews with relatives and business associates of their subjects, and other sources to obtain information about individuals. *Genealogists* use birth, death, and marriage certificates, court and military records, wills, records of real estate

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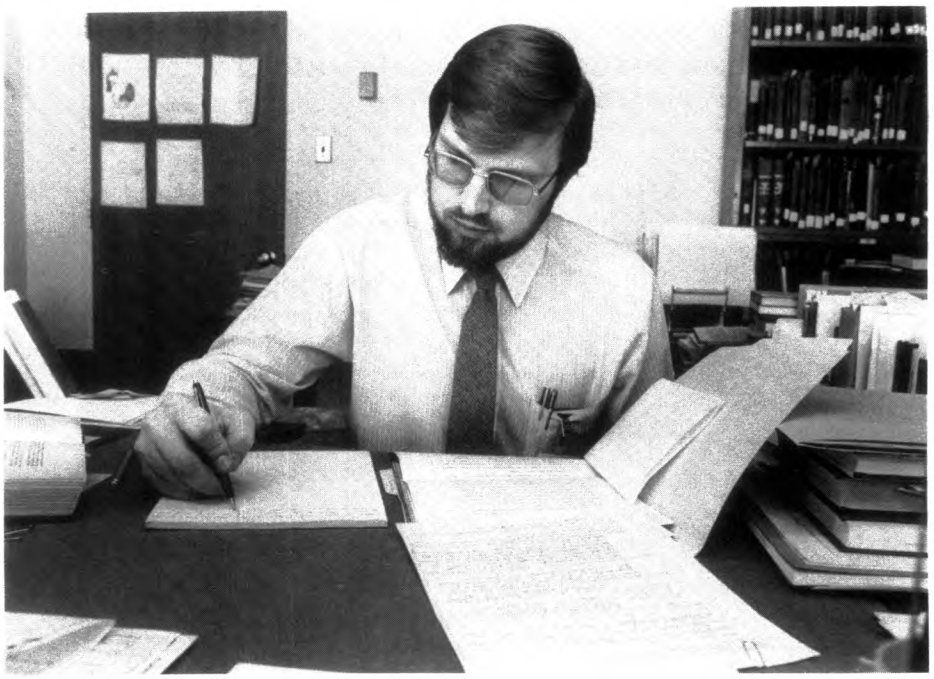
transactions, and other evidence to trace a family history.

A growing number of historians are employed to help protect and preserve historic buildings and sites. They work to identify and interpret our historical heritage, which includes houses, public buildings, factories, churches, forts, public markets, farms, and battlefields. Some historians are employed to manage, interpret, and write about restored communities and other places of historic interest. Historic preservationists also work to save city neighborhoods and old business districts and maintain unique historic and architectural qualities. They also inform the public and government officials of the value of preserving cultural resources and assist in educational activities for which historic properties will be used. This work usually means a joint effort with architects, lawyers, urban planners, business and community leaders, and city officials.

Some historians consult with editors, publishers, and producers of materials for radio, television, and motion pictures. Others do research for government agencies, social science research firms, and similar organizations. *Public historians* help policymakers address increasingly complex social and economic problems. Such historians might be asked, for example, to assist in the preparation of an environmental impact statement or to provide information for a community development plan that involves housing, transportation, energy use, and other vital issues.



Historians need a spirit of intellectual inquiry.

## Working Conditions

Historians employed in colleges and universities have flexible work schedules, dividing their time among teaching, research, and administrative responsibilities. Those in government agencies and private firms, on the other hand, have much more structured schedules. While working alone behind a desk, they read and write research reports. Many experience the pressures of deadlines and tight schedules, and sometimes must work overtime. Their routine may be interrupted by telephone calls, letters, special requests for information, meetings, or conferences. Travel may be necessary to collect information or attend meetings.

## Employment

An estimated 20,000 persons worked as professional historians in 1980. Colleges and universities employed most of them—about 70 percent. Historians also work in archives, libraries, museums, research and educational organizations, historical societies, publishing firms, large corporations, and government agencies. Historians, archivists, and museum curators employed in the Federal Government work principally in the National Archives, Smithsonian Institution, General Services Administration, or in the Departments of Defense, Interior, and State. Other Federal employers include the National Aeronautics and Space Administration, Central Intelligence Agency, National Security Agency, and the Departments of Agriculture, Commerce, Energy, Transportation, and Health and Human Services. A number work for State and local governments.

## Training, Other Qualifications, and Advancement

Graduate education usually is necessary for a job in this field. A master's degree in history is the minimum requirement for the position of college instructor. However, a Ph.D. degree is required for a first appointment at some institutions of higher education and for many other entry level positions. A Ph.D. is required for a professorship or a top administrative position, and to gain tenure. However, tenure is becoming increasingly difficult to acquire.

Even though historians in the Federal Government generally must have a college degree with 24 semester hours in history, requirements vary for certain specialists. For example, archivists need a college degree with 18 semester hours in American history or government and 12 additional hours of history, American civilization, economics, political science, or related fields; museum curators need an advanced degree in museum studies or in an appropriate field such as art history, American history or the history of technology. However, because competition for Federal jobs is keen, additional education or experience is most often required. Most historians in the Federal Government and in nonprofit organizations have Ph.D. degrees or their equivalent in training and experience.

Although a bachelor's degree with a major in history is sufficient for some beginning jobs in government—either Federal, State, or local—advancement opportunities may be limited for persons without at least a master's and preferably a Ph.D. in history. Since beginners likely will collect and preserve historical data, a knowledge of archival work is helpful.

Training for historians is available in many colleges and universities. About 800 schools offer programs for the bachelor's degree; 330, the master's; and about 140, the doctorate.

History curriculums in the Nation's colleges and universities are varied; however, each basically provides training in research methods, writing, and speaking. These basic skills are essential for historians in all positions. Quantitative methods of analysis, including statistical and computer techniques, are increasingly important for historians. Most doctoral candidates must exhibit competence in at least one foreign language.

Because of the tightening job market in colleges and universities, more history departments are placing greater emphasis on preparing students for nonacademic careers. Increasingly, courses and programs are designed to prepare graduates for museum jobs, archival management, historical editing, public historical studies, historic preservation, and other applied research. Courses in other applied fields such as public administration, business administration, and finance also greatly enhance one's opportunities for nonacademic employment.

Historians spend a great deal of time doing research, writing papers and reports, and giving lectures and presentations. They must possess strong analytical skills in order to evaluate historical evidence and work effectively with abstractions and theories. They must be systematic and objective in their work, since they must consider all relevant facts before reaching a conclusion. Patience and persistence are necessary because historians spend long hours in independent study. As in other fields of scientific endeavor, the

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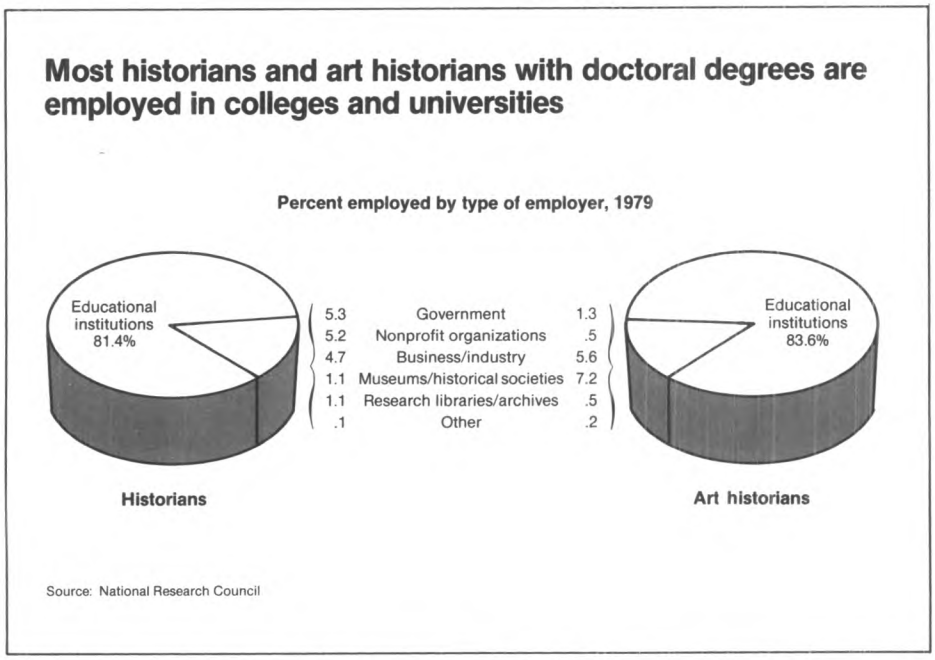


qualities of intellectual curiosity and creativity are essential.

Presenting the results of their research is an important part of a historian's job, so the ability to communicate effectively—both orally and in writing—is a "must." The ability to work with others on joint research projects can be important.

## Job Outlook

Overall, little if any growth is expected in the employment of historians through the 1980's. Replacement needs accordingly will constitute the principal source of jobs. This will be particularly true in colleges and universities, where the basic determinant of demand for college faculty is enrollment. College enrollments are expected to decline during the 1980's. Fewer students almost certainly would mean some decrease in employment of college faculty over the period. On the other hand, demand for historians to work in nonacademic institutions may increase.

Persons with computer backgrounds and training in quantitative methods in historical research are expected to have the most favorable job opportunities in business, industry, government, and research firms. Historians with strong backgrounds in historic preservation, public historical studies, or other applied disciplines such as public administration, business administration, or finance also may be in a relatively favorable position.

The oversupply of history graduates is expected to continue; throughout the 1980's, the number of persons seeking to enter the occupation will greatly exceed available positions. As a result, historians with a Ph.D. are expected to face very keen competition for positions. Those graduating from prestigious universities may have some advantage in this highly competitive situation. Since academic institutions traditionally employ many highly qualified historians and competition is expected to be particularly keen, only a small proportion of new graduates are expected to find full-time teaching positions. Many Ph.D.'s are expected to accept part-time, temporary assignments as instructors with little or no hope of gaining tenure. Applicants who are qualified to teach several areas of history, such as American history combined with Russian or Asian history, should have the best opportunities. An increasing number of Ph.D.'s will take research or administrative positions in government, industry, research firms, and other nonacademic institutions.

Persons with the master's degree in history also will encounter severe competition for jobs as historians. Some may find teaching positions in junior and community colleges. Those who have taken courses in historic preservation and museum studies should have the best opportunities to work in government and industry. Those who meet State certification requirements may become secondary school teachers.

People with a bachelor's degree in history are likely to find very limited opportunities for employment as professional historians. However, an undergraduate major in history provides an excellent background for many jobs including international relations, journalism, library science, and foreign service, and for continuing education in law, business administration, and related disciplines. Many graduates will find jobs in secondary schools or in government, business, and industry as management or sales trainees, or as research or administrative assistants.

## Earnings

According to information from the American Historical Association, colleges and universities offered new Ph.D.'s starting salaries ranging from about $14,000 to $16,000 for the academic year 1979-80. Full professors and top administrators earn substantially more.

According to a survey by the National Research Council, the 1979 median annual salary for Ph.D.'s in history was $23,900; in educational institutions, $24,400. The median annual salary of Ph.D.'s in art history was $21,800; in educational institutions, $22,100.

The Federal Government recognizes education and experience in certifying applicants for entry level positions. In general, historians having a bachelor's degree could start at about $12,300 or $15,200 a year in early 1981, depending upon the applicant's academic record. The starting salary for those having a master's degree was about $18,600 a year, and for those having a Ph.D., about $22,500. Historians in the Federal Government averaged around $29,000 a year in 1980; museum curators, around $28,300; and archivists, around $26,700.

Many historians, particularly those in college teaching, supplement their income by teaching summer classes, writing books or articles, or giving lectures.

## Related Occupations

Historians study past events, institutions, and ideas. Their concern with understanding how societies operate is shared by other workers, including writers, journalists, political scientists, economists, sociologists, anthropologists, geographers, urban and regional planners, and market research analysts.

## Sources of Additional Information

Additional information on careers and job openings for historians, and on schools offering various programs in history, is available from:

American Historical Association, 400 A St. SE., Washington, D.C. 20003.

For information on careers and schools offering degree programs and courses in historic preservation, contact:

National Trust for Historic Preservation, 1785 Massachusetts Ave. NW., Washington, D.C. 20036.

General information on careers for historians is available from:

Organization of American Historians, Indiana University, 112 North Bryan St., Bloomington, Ind. 47401.

For additional information on careers for historians, send a self-addressed, stamped envelope to:

American Association for State and Local History, 1400 Eighth Avenue South, Nashville, Tenn. 37203.

For information on museum careers and museum studies programs, contact:

Office of Museum Programs, Arts and Industries Building, Room 2235, Smithsonian Institution, Washington, D.C. 20560.

For information on training for museum careers, contact:

American Association of Museums, 1055 Thomas Jefferson St. NW., Washington, D.C. 20007.

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# Market Research Analysts

(D.O.T. 050.067-014)

## Nature of the Work

If a business is to be successful, it must provide a product or service people will buy. Yet persuading people to spend their money requires more than simply offering a useful or desirable item. People try a product for many reasons in addition to basic utility. They consider price, of course, as well as convenience, appearance, and a trusted name. For some products, reliability and ease of maintenance are most important. Very often, it is the product's image—created by advertisements, sales promotion, and the type of store in which it is sold—that influences people.

Business executives have to make decisions concerning all these areas when they put a product or service on the market. Other organizations, whether they are asking the public to volunteer their time, contribute to a charity, or even spend a vacation in their State, must make similar decisions. Market research analysts analyze the buying public and its wants and needs, thus providing the information on which these marketing decisions can be based.

Market research analysts plan, design, implement, and analyze the results of surveys. Most marketing research starts with a collection of data and information about products or services and the people who are likely to buy the product or service. For example, if the researcher's task is to find out why a company's frozen foods are not selling well in a certain city, he or she may start by studying the company's current marketing strategy to see if it matches consumers' needs. Is the company shipping foods that suit the tastes of most people in the city? Are the prices reasonable for the income of most people in the area? Does the distributor deliver the food to the stores in good condition? Is the company advertising its products, and are the ads seen by the people most likely to buy them? Is the company's sales force well trained and actively promoting the product to the stores? Are the stores providing good shelf space or are the boxes of food in a corner of the freezer where they may be overlooked? By investigating these and other issues, market research analysts determine what actions should be taken. They may conclude, for example, that sales would be improved substantially by increased newspaper advertising. Or they may conclude that the company should concentrate its efforts in other sections of the country where the product is more successful.

Since the goal of marketing is to satisfy the consumer, research analysts often are concerned with finding out customers' preferences and buying habits. They conduct telephone, personal, or mail surveys, and sometimes offer samples of a product to find out whether potential customers are pleased with the design.

Market researchers employed by large organizations often work with statisticians who help them select a group of people to be interviewed who will accurately represent prospective customers, and "motivational research" specialists who design survey questions that produce reliable information. Trained interviewers then conduct the survey, and office workers tabulate the results under the direction of market research analysts.

In contrast to surveys for consumer goods, researchers for business and industrial firms often conduct the interviews themselves to gather opinions of a product. They also may speak to company officials about new uses for it. Therefore, they must have a thorough knowledge of both marketing techniques and the industrial uses of the product.

## Working Conditions

Market research analysts usually work in modern, centrally located offices. While market research analysts often function as an integral part of a research team, they spend much time alone—planning surveys, using calculators and computers, preparing statistical charts, and analyzing data. Some, especially those employed by independent research firms, travel frequently when working with out-of-town clients. Also, they may have to work long hours, including nights and weekends, to meet deadlines.

## Employment

An estimated 29,000 market research analysts were employed in 1980. Most jobs for market research analysts are found in manufacturing companies, advertising agencies, and independent research organizations. Large numbers are employed by stores, radio and television firms, and newspapers; others work for university research centers and government agencies. Market research organizations range in size from one-person enterprises to firms with a hundred employees or more.

Many market research analysts are employed in large cities such as New York where major advertising agencies, independent marketing organizations, and central offices of large manufacturers are located. However, market research analysts are employed in many smaller cities as well—wherever there are central offices of large manufacturing and sales organizations.

## Training, Other Qualifications, and Advancement

Although a bachelor's degree usually is sufficient for trainees, graduate education is necessary for many specialized positions in market research. Graduate study usually is required for advancement, and a sizable number of market researchers have a master's degree in business administration or some other graduate degree in addition to a bachelor's degree in marketing. Some schools offer market research internships in which students gain experience and make contacts that may prove invaluable in landing a job. Some people qualify for jobs through previous experience in other types of research; university professors of marketing or statistics, for example, may be hired to head marketing research departments in business firms or advertising agencies. Sociologists, economists, and others who have strong backgrounds in quantitative research methods also qualify for many market research positions.

Market research analysts study customer preferences in order to suggest appropriate sales techniques.

Bachelor's programs in marketing and related fields, including courses in statistics, English composition, communications, psychology, sociology, and economics, are valuable preparation for work in market research. Some market research positions require specialized skills such as engineering, or sales experience and a thorough knowledge of the company's products. Since quantitative research is central to survey analysis, sales forecasting, cost analysis, and other aspects of market research work, a strong background in computer science is helpful.

College graduates may find their first job in any of a number of places: The market research department of a large manufacturing company, a research firm, an advertising agency, a lending institution, an insurance company, a government planning agency, or even a university marketing department.

Trainees usually start as research assistants or junior analysts. At first, they may do considerable clerical work, such as copying data from published sources, editing and coding questionnaires, and tabulating survey returns. They also learn to conduct interviews and write reports on survey findings. As they

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gain experience, assistants and junior analysts may assume responsibility for specific market research projects, or advance to supervisory positions. An exceptionally able worker may become market research director or vice president for marketing or sales.

Market research analysts must be able to analyze problems objectively and apply various techniques to their solution. Creativity is essential in formulating new ideas. Patience and perseverance are necessary to complete long research projects. As advisers to management, market research analysts should be skilled in both written and verbal communication.

## Job Outlook

Opportunities for the most prestigious, highest paying jobs should be best for applicants with graduate degrees in business including courses in market research, statistics, and computer science. The growing complexity of market research techniques also may expand opportunities in this field for psychologists, economists, and other social scientists.

Employment of market research analysts is sensitive to cyclical swings in the economy. Market research employment rises as new products and services are developed, particularly when business activity and personal incomes are expanding rapidly. In periods of slow economic growth, however, the reduced demand for marketing services may limit the hiring of research workers.

Over the long run, population growth and the increased variety of goods and services that businesses and individuals will require are expected to stimulate a high level of marketing activity. Competition among manufacturers of both consumer and industrial products makes the appraising of marketing situations important. As techniques improve and statistical data accumulate, company officials are likely to turn more often to market research analysts for information and advice. As a result, employment of market research analysts is expected to grow faster than the average for all occupations through the 1980's.

New job opportunities are expected to arise in health care facilities, banks, accounting firms, local governments, and other organizations to help promote use of their services. For example, market research analysts might be needed to help determine the optimum location for a new hospital or subway station.

## Earnings

Salaries of beginning market researchers ranged from about $12,000 to $17,000 a year in 1980, according to the limited information available. Persons with master's degrees in business administration and related fields usually started with salaries of about $21,500 a year. Starting salaries varied according to the type, size, and location of the firm as well as the exact nature of the position.

Experienced workers such as senior analysts received salaries of about $27,000 a year. Earnings were highest, however, for workers in management positions of great responsibility. Directors of market research averaged about $40,000 a year in 1980. Market research directors who had more than 15 years' experience averaged almost $50,000 a year in 1980.

## Related Occupations

Besides market research analysts, many others are involved in social research—including the planning, implementation, and analysis of surveys to learn more about people's wants and needs. Some of these workers include economists, employment research and planning directors, social welfare research workers, political scientists, urban and regional planners, sociologists, developmental psychologists, and experimental psychologists.

## Sources of Additional Information

A pamphlet, "Careers in Marketing" (Monograph Series No. 4), may be obtained from:

American Marketing Association, 250 Wacker Street, Chicago, Ill. 60606.

# Political Scientists

(D.O.T. 051, 059.267-010, and 090.227-010)

## Nature of the Work

Political scientists study political behavior and institutions. Although some specialize in political theory or philosophy, most political scientists, particularly those specializing in public administration, analyze the organization and operation of government at all levels in the United States and abroad. They explore such phenomena as public opinion, political parties, elections, special interest groups, and intergovernmental relations. They also study the role of Federal, State, and local governments including the Presidency, Congress and State legislatures, and the judicial system. Processes and techniques of public administration and public policymaking also are of interest to political scientists.

Political scientists examine political and administrative behavior in order to aid government leaders and others trying to develop policies and plan programs that meet a society's needs. Like other social scientists, political scientists are research oriented and base their theories on a systematic analysis of the data they collect. Depending on the topic under study, a political scientist might conduct a public opinion survey, analyze election results, or compare the principal features of various tax proposals. Some areas of political science research are highly quantitative, and involve the use of sophisticated simulation and modeling techniques.

Most political scientists work in colleges and universities. They may combine research or administrative duties with teaching, and often they do consulting work as well. (For more information, see the statement on college and university faculty elsewhere in the *Handbook*).

Some political scientists are primarily researchers or consultants in nonacademic organizations. They might survey public opinion on a current issue, explore the political and administrative ramifications of government reorganization, or suggest ways of mobilizing support for a particular candidate, policy, or administrative change. The results of political science research are used by public officials, political parties, government administrators, legislative staffs and committees, citizens' groups, legislative reference bureaus, taxpayers' associations, and business firms.

Because of their understanding of political institutions and political and administrative processes, political scientists are well qualified for jobs in and out of government. Many are employed in government management and staff positions; others are employed by legislatures and courts; still others are involved in government relations. Here they may work as lobbyists or consultants for government liaison by business firms, trade associations, public interest groups, and other organizations. Some political scientists work for large banks and corporations, analyzing political conditions in foreign countries to help these organizations formulate investment plans abroad. Other political scientists work as journalists. A few work primarily as advisors to candidates for political office.

## Working Conditions

Political scientists employed in colleges and universities divide their time among teaching, research, and administrative responsibilities. Those employed by government agencies and private firms, on the other hand, have much more structured schedules. They study and interpret data, prepare reports, confer with coworkers, and meet with government officials, business executives, and others. Many experience the pressures of deadlines, tight schedules, and heavy workloads, and sometimes must work overtime. They may travel to interview people, conduct surveys, attend meetings and conferences, and present reports.

Political scientists on foreign assignment must adjust to unfamiliar cultures and climates. Those in the diplomatic service work long and irregular hours, both in the office and in many social activities considered part of the job.

## Employment

An estimated 15,000 persons worked as political scientists in 1980. About three-fourths worked in colleges and universities.

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An interest in politics and hard work can lead to a job on Capitol Hill.

Most of the remainder worked for government firms, political organizations, research institutes, labor unions, public interest groups, or business firms. This estimate does not include political scientists who work as administrators in the government, in the private sector, or in journalism and related positions.

Political scientists can be found in nearly every college or university town since courses in government and political science are taught in almost all institutions of higher education. Since the national headquarters of many associations, unions, and other organizations are located in Washington, D.C., this area attracts a sizable number of political scientists in research or policy jobs.

Government employs political scientists both domestically and abroad. They deal with legislative or administrative matters in areas such as foreign affairs, international relations, intelligence, housing, economic development, transportation, environmental protection, social welfare, or health. Political scientists also apply their analytical expertise in fields such as marketing, advertising, public relations, personnel, finance, and consumer affairs.

## Training, Other Qualifications, and Advancement

Graduate training generally is required for employment as a political scientist. Completion of all the requirements for the Ph.D. degree is the prerequisite for appointment to academic positions in some colleges and universities and is required for a professorship and tenure, which is becoming increasingly difficult to attain. Because of the tightening academic job market, a Ph.D. is increasingly required for nonacademic jobs.

Graduates with a master's degree can qualify for teaching positions in junior and community colleges and for administrative and research positions in government, industry, and research or civic organizations. A master's degree in international relations, foreign service, or a particular foreign area provides a suitable background for Federal Government positions dealing with foreign affairs. Competence in one or more foreign languages may be important to enter the Foreign Service. Minimum requirements for intelligence, foreign affairs, and international relations specialists in the Federal Government generally include a college degree with 24 semester hours in political science, history, economics, or related fields. However, because competition for Federal jobs is keen, additional education or experience may be required. A growing number of applicants for the Foreign Service, for example, have a Ph.D., law degree, or other advanced degree.

People with a bachelor's degree in political science may qualify as trainees in such areas as management, research, administration, sales, and law enforcement. Many students with bachelor's degrees in political science go on to study law, journalism, or some specialized or related branch of political science, such as public administration or international relations.

In 1980, about 1,400 colleges and universities offered a bachelor's degree in political science; around 165, master's programs; about 120, doctoral programs. Approximately 250 schools offered specialties in public administration. Some schools combine political science with another discipline such as history in one department, while others have separate departments of political science, public administration, international studies, or other fields. Some universities have separate schools of public affairs and administration. Colleges and universities strongly recommend field training and internships in government, politics, public service, and similar fields. Internships give students an opportunity to gain experience and make contacts for jobs later on. However, the number of internships is limited and prospective interns face keen competition.

Undergraduate programs in political science include courses in the principles of government and politics, State and local government, comparative studies, political theory, foreign area studies, foreign policy, public administration and policy, political behavior, constitutional, administrative, and international law, and many other offerings. Other courses might deal with the problems of detente, politics of economic growth and scientific technology, environmental and energy policies, legal status of women, and international economics. Because of the bleak academic job market, political science departments are placing greater emphasis on preparing students for nonacademic careers. For example, a growing number of programs at both the undergraduate and graduate levels offer courses in quantitative and statistical methods, including the use of computers.

Graduate students may specialize in American government, State and local government, comparative politics, international relations, foreign area studies, political behavior, political theory, public administration, urban affairs, public policy, and other areas. Doctoral candidates often must exhibit competence in one or more foreign languages and quantitative research techniques.

Persons planning to be political scientists should have qualities that are important in any research or management career. Most important of all are intellectual curiosity—a questioning, probing mind and a keen interest in solving problems—and a commitment to public service. Political scientists also must think objectively and independently, handle data carefully and systematically, and analyze information and ideas. Patience and persistence are important in conducting independent research, and creativity helps in formulating ideas. Because the results of political science research are almost always presented orally or

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in writing, communication skills are important, too. The ability to write clearly and well is essential.

For some political scientists, an intense interest in political systems and the way they operate is an asset. Active participation in student government, local political campaigns, community newspapers, service clubs, and community activities is recommended for the practical experience and perspective it can provide. Such experience is particularly useful for political scientists who specialize in politics or community organization.

## Job Outlook

Employment of political scientists is expected to increase more slowly than the average for all occupations through the 1980's. Because most political scientists are relatively young, very few job openings will result from deaths and retirements. Colleges and universities, the traditional employers of highly qualified political scientists, are not expected to hire additional faculty members; indeed, as college enrollments decline, some vacancies may remain unfilled. However, demand may increase for political scientists who work in nonacademic positions. For example, large banks and corporations may increasingly hire political scientists to conduct political analyses of conditions in foreign countries to help plan investment strategies. Also, polling and marketing research firms will increasingly seek graduates well trained in survey research methods.

Because graduates with advanced degrees in political science will greatly exceed job openings through the 1980's, even Ph.D.'s will face stiff competition, particularly for academic jobs. The prestige of the university from which a Ph.D. graduates may be increasingly important in this highly competitive situation. Many Ph.D.'s seeking college teaching jobs are expected to accept part-time, temporary assignments as instructors with little or no hope of gaining tenure. Graduates seeking to enter the Foreign Service also face very stiff competition. Graduates with strong backgrounds in quantitative techniques, including computer science, should have the widest choice of jobs. Those trained in applied fields such as public administration, public policy, and American government also should be in a relatively favorable position. Graduates who majored in comparative politics, international relations, and political theory face the most difficult job market.

Master's degree holders will face increasing competition for both academic and nonacademic positions. Some will find teaching jobs in community and junior colleges. As with Ph.D.'s, graduates trained in quantitative methods, public policy, or public administration have the best opportunities for jobs in Federal, State, and local government, research bureaus, political organizations, and business firms.

New graduates with a bachelor's degree are expected to find few opportunities for jobs as professional political scientists. Many of these graduates are expected to accept positions as trainees in government, business, and industry. Persons who have successfully completed an internship will have an advantage. For those planning to continue their studies in law, foreign affairs, journalism, and related fields, political science provides an excellent background. Graduates who meet State certification requirements may enter high school teaching.

## Earnings

According to an American Political Science Association Survey, the median salaries of political scientists employed in educational institutions during 1979-80 were around $27,500 for full professors, $21,500 for associate professors, $16,500 for assistant professors, and $14,500 for lecturers and instructors.

The Federal Government recognizes education and experience in certifying applicants for entry level positions. In general, the entrance salary for those with a bachelor's degree, depending upon the applicant's academic record, was about $12,300 or $15,200 a year in early 1981. The starting salary for those with a master's degree was about $18,600 a year, and for those with a Ph.D., about $22,500. Intelligence specialists in the Federal Government averaged around $29,400 in 1980; international relations specialists, $35,300; and foreign affairs specialists, $34,100.

Some political scientists, particularly those in college teaching, supplement their income by teaching summer courses or consulting.

A political scientist's training enables him or her to understand the ways in which political power is amassed and used. Knowledge of the political process also is important for journalists, lawyers, city managers, Foreign Service Officers, political campaign managers and consultants, pollsters, lobbyists, legislative liaison officers, political aides, and politicians.

## Sources of Additional Information

The American Political Science Association, 1527 New Hampshire Ave. NW., Washington, D.C. 20036 offers a career pamphlet for undergraduates and one for faculty and graduate students at $1 each. *A Guide to Graduate Study in Political Science* is available for $7.50 for members and $10 for nonmembers. In addition, a monthly newsletter listing job openings, primarily academic, is available to members of the association.

*Programs in Public Affairs and Administration*, a directory that contains data on the academic content of programs, the student body, the format of instruction, and other information, may be purchased for $10 from:

National Association of Schools of Public Affairs and Administration, 1225 Connecticut Ave. NW., Suite 306, Washington, D.C. 20036.

For additional information on careers in the Foreign Service, contact:

Board of Examiners, Foreign Service, Box 9317, Rosslyn Station, Arlington, Va. 22209.

For several directories that provide information on internships, contact:

The National Society for Internships and Experiential Education, 1735 I St. NW., Suite 601, Washington, D.C. 20006.

# Psychologists

(D.O.T. 045.061, .067, .107-022, -026, -030, and -034; and 090.227-010)

## Nature of the Work

Psychologists study human behavior and mental processes to understand and explain people's actions. Some research psychologists investigate the physical, emotional, or social aspects of human behavior. Others in colleges and universities combine teaching, research, and administration. (For more information, see the *Handbook* statement on college and university faculty.) Still other psychologists in applied fields counsel and conduct training programs; do market research; or provide health services in hospitals or clinics.

Like other social scientists, psychologists collect and test the validity of data and formulate hypotheses. Research methods depend on the topic under study. Psychologists may gather information through controlled laboratory experiments; performance, aptitude, and intelligence tests; observation, interviews, and questionnaires; clinical studies; or surveys.

Psychologists usually specialize. *Experimental psychologists* study behavior processes, and work with human beings and lower animals such as rats, monkeys, and pigeons; prominent areas of experimental research include motivation, learning and retention, sensory and perceptual processes, and genetic and neurological factors in behavior. *Developmental psychologists* study the patterns and causes of behavioral change as people progress through life; some concern themselves with behavior during infancy and childhood, while others study changes that take place during maturity and old age. *Personality psychologists* study human nature, individual differences, and the ways in which those differences develop. *Social psychologists* examine people's interactions with others and with the social environment; prominent areas of study include group behavior, leadership, attitudes, and interpersonal perception. *Comparative psychologists* study the behavior of different animals, including humans. *Physiological psychologists* study the relationship of behavior to the biological functions of the body. Psychologists in the field of *psychometrics* develop and

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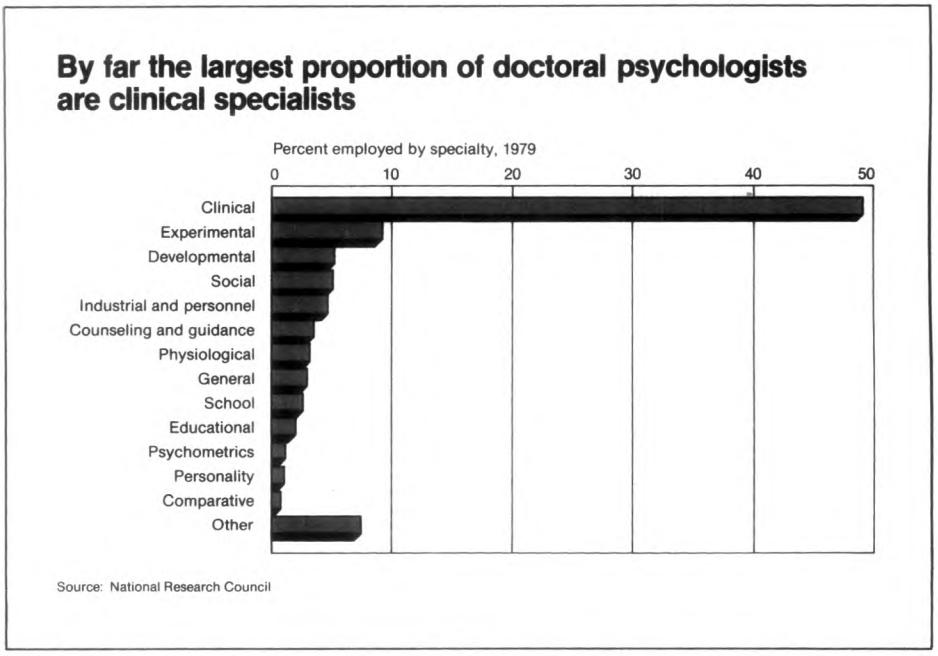
apply procedures for measuring psychological variables such as intelligence and personality.

Clinical psychology is the largest specialty among doctoral psychologists. *Clinical psychologists* generally work in hospitals or clinics, or maintain their own practices. They help the mentally or emotionally disturbed adjust to life. They interview patients; give diagnostic tests; provide individual, family, and group psychotherapy; and design and carry through behavior modification programs. Clinical psychologists may collaborate with physicians and other specialists in developing treatment programs. Some clinical psychologists work in universities where they train graduate students in the delivery of mental health services. Others administer community mental health programs. *Counseling psychologists* use several techniques, including interviewing and testing, to advise people on how to deal with problems of everyday living—personal, social, educational, or vocational. *Educational psychologists* design, develop, and evaluate educational programs. *School psychologists* evaluate students' needs and problems, facilitate school adjustment, and help solve learning and social problems in schools. *Industrial and organizational psychologists* apply psychological techniques to personnel administration, management, and marketing problems. They are involved in policy planning, training and development, psychological test research, counseling, and organizational development and analysis, among other activities. For example, an industrial psychologist may work with management to develop better training programs and to reorganize the work setting to improve worker productivity. *Engineering psychologists*, often employed in factories and plants, develop and improve human-machine systems, military equipment, and industrial products. *Community psychologists* apply psychological knowledge to problems of urban and rural life. *Consumer psychologists* study the psychological factors that determine an individual's behavior as a consumer of goods and services. *Health psychologists* counsel the public in health maintenance to help people avoid serious emotional or physical illness. Other areas of specialization include environmental psychology, population psychology, psychology and the arts, history of psychology, psychopharmacology, and military and rehabilitation psychology.

Clinical psychologists need to be good listeners.




## Working Conditions

A psychologist's specialty and place of employment determine his or her working conditions. For example, clinical and counseling psychologists in private practice have pleasant, comfortable offices and set their own hours. However, they often have evening hours to accommodate their clients. Some employed in hospitals, nursing homes, and other health facilities often work evenings and weekends, while others in schools and clinics work regular hours. Psychologists employed by academic institutions divide their time among teaching, research, and administrative responsibilities. Some maintain part-time clinical practices as well. In contrast to the many psychologists who have flexible work schedules, some in government and private industry have more structured schedules. Reading and writing research reports, they often work alone behind a desk. Many experience the pressures of deadlines, tight schedules, heavy workloads, and overtime work. Their routine may be interrupted frequently. Travel may be required to attend conferences or conduct research.

## Employment

An estimated 106,000 people worked as psychologists in 1980. The largest group worked in educational institutions—primarily colleges and universities. Some were counselors; others were researchers, administrators, or teachers.

The second largest group of psychologists work in hospitals, clinics, rehabilitation centers, nursing homes, and other health facilities. Many others work for government agencies at the Federal, State, and local levels. The Veterans Administration, the Department of Defense, and the Public Health Service employ more psychologists than other Federal agencies. Psychologists also are employed by research organizations, management counsulting firms, market research firms, and other businesses. After several years of experience, some enter private practice or set up their own research or consulting firms.

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## Training, Other Qualifications, and Advancement

A doctoral degree, required for employment as a psychologist, is increasingly important for advancement and tenure, particularly in the academic world. People with doctorates in psychology (Ph.D. or Psy.D.—Doctor of Psychology) qualify for a wide range of responsible research, clinical, and counseling positions in universities, private industry, and government.

People with a master's degree in psychology can administer and interpret tests as psychological assistants. Under the supervision of psychologists, they can conduct research in laboratories or perform administrative duties. They may teach in 2-year colleges, or work as school psychologists or counselors. (See the *Handbook* statements on school counselors and rehabilitation counselors.)

People with a bachelor's degree in psychology are qualified to assist psychologists and other professionals in community mental health centers, vocational rehabilitation offices, and correctional programs; to work as research or administrative assistants; to take jobs as trainees in government or business; or—provided they meet State certification requirements—to teach high school. However, without additional academic training, their advancement opportunities are limited.

In the Federal Government, candidates having at least 24 semester hours in psychology and one course in statistics qualify for entry level positions. Competition for these jobs is keen, however. Clinical psychologists generally must have completed the Ph.D. or Psy.D. requirements and have served an internship; vocational and guidance counselors usually need 2 years of graduate study in counseling and 1 year of counseling experience.

At least 1 year of full-time graduate study is needed to earn a master's degree in psychology. Requirements usually include practical experience in an applied setting or a master's thesis based on a research project. Three to five years of graduate work usually are required for a doctoral degree. The Ph.D. degree culminates in a dissertation based on original research. The Psy.D., based on practical work and examinations rather than a dissertation, prepares students for clinical and other applied positions. In clinical or counseling psychology, the requirements for the doctoral degree generally include an additional year or more of internship or supervised experience.

Competition for admission into graduate programs is keen. Some universities require an undergraduate major in psychology. Others prefer only basic psychology with courses in the biological, physical, and social sciences, statistics, and mathematics.

Over 1,100 colleges and universities offer a bachelor's degree program in psychology; about 400, a master's; about 300, a Ph.D.; and about 10, a Psy.D. In addition, a growing number of professional schools of psychology not affiliated with colleges or universities offer the Psy.D. The American Psychological Association (APA) presently accredits Ph.D. training programs in clinical, counseling, and school psychology as well as Psy.D. programs. In early 1981, over 120 colleges and universities offered fully approved programs in clinical psychology; 28, in counseling psychology; 17, in school psychology; and 6 Psy.D. programs. APA also has approved about 130 internship facilities for doctoral training in clinical and counseling psychology.

Although financial aid is becoming increasingly difficult to obtain, some universities award fellowships or scholarships, or arrange for part-time employment. The Veterans Administration (VA) offers predoctoral traineeships to interns in VA hospitals, clinics, and related training agencies. The National Science Foundation, the Department of Health and Human Services, the Armed Forces, and many other organizations also provide financial aid.

Psychologists who want to enter independent practice must meet certification or licensing requirements. In 1980, most States and the District of Columbia had such requirements. Licensing laws vary by State, but generally require a doctorate in psychology and 2 years of professional experience. In addition, most States require that applicants pass a written and an oral examination. Most State boards administer a standardized test. Some States certify those with master's level training as psychological assistants or associates. Some States require continuing education for relicensure.

Most States require that licensed or certified psychologists limit their practice to those areas in which they have developed professional competence through training and experience.

The American Board of Professional Psychology recognizes professional achievement by awarding diplomas in clinical, counseling, industrial and organizational, and school psychology. Candidates generally need a doctorate in psychology, 5 years of experience, and professional endorsements; they also must pass an examination.

People pursuing a career in psychology must be emotionally stable, mature, and able to deal effectively with people. Sensitivity, compassion, and the ability to lead and inspire others are particularly important for clinical work and counseling. Research psychologists should be able to do detailed work independently and as part of a team. Verbal and writing skills are necessary to communicate research findings. Patience and perseverance are vital qualities because results from psychological treatment of patients or research often are long in coming.

## Job Outlook

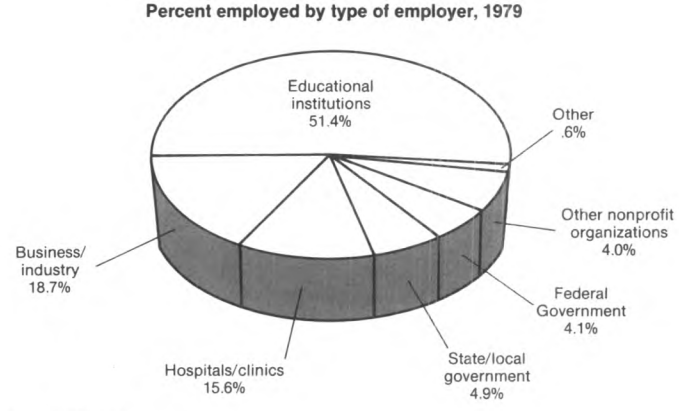
Employment of psychologists is expected to increase about as fast as the average for all occupations through the 1980's. In addition to growth in demand for psychologists, some openings will result from transfers, deaths, retirements, and other separations from the labor force.

Several factors may help maintain the demand for psychologists: (1) Public concern for the development of human resources which may result in more services for minorities, the elderly, and the poor; (2) increased testing and counseling of children; and (3) legislation emphasizing good health rather than treatment of illness.

Some openings are likely to occur as psychologists increasingly study the effects on people of technological advances in areas such as agriculture, energy, the environment, and the conservation and use of natural resources. Psychologists also increasingly are involved in program evaluation in such fields as health, education, military service, law enforcement, and consumer protection.

Because college enrollments are expected

**Educational institutions, businesses, and hospitals and clinics are the primary employers of doctoral psychologists**




Source: National Research Council

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to decline during the 1980's, little or no employment growth is expected in colleges and universities. As a result, there will be keen competition for academic positions. Although outstanding Ph.D. holders from leading universities should have no difficulty in obtaining teaching jobs at top schools, a larger number of Ph.D.'s will be forced to take jobs at smaller, less prestigious institutions. Some may accept part-time or temporary assignments with little or no hope of gaining tenure. As a result, many psychologists are expected to seek nonacademic jobs.

Persons holding doctorates from leading universities in applied areas such as clinical, counseling, health, and industrial or organizational psychology will have more favorable prospects for nonacademic jobs than those trained in research specialties such as experimental, physiological, and comparative psychology. Psychologists with extensive training in quantitative research methods and computer science will have a competitive edge over applicants without this background.

Persons with only a master's degree in psychology will probably continue to encounter severe competition for the limited number of jobs for which they qualify. Nevertheless, some may find jobs as counselors in schools or as psychological assistants in community mental health centers. Bachelor's degree holders may find jobs as assistants in rehabilitation centers.

## Earnings

According to a 1979 survey by the National Research Council, the median annual salary of doctoral psychologists was about $26,600. In educational institutions, the median was about $25,400; in the Federal Government, about $36,300; in State and local government, about $24,800; in hospitals and clinics, about $25,300; in other nonprofit organizations, about $25,400; and in business and industry, about $36,700. Ph.D. or Psy.D. psychologists in private practice and in applied specialties generally have higher earnings than other psychologists.

The Federal Government recognizes education and experience in certifying applicants for entry level positions. In general, the entrance salary for psychologists having a bachelor's degree was about $12,300 or $15,200 a year in early 1981; counseling psychologists with a master's degree and 1 year of counseling experience could start at $18,600; clinical psychologists having a Ph.D. or Psy.D. degree and 1 year of internship could start at $22,500. The average salary for psychologists in the Federal Government was about $31,800 a year in 1980.

According to a 1980 State salary survey, average annual salaries of clinical psychologists in State government ranged from about $20,100 to $27,000. These positions usually require a doctor's degree in clinical psychology plus completion of an approved internship or period of supervised experience.

## Related Occupations

Psychologists are trained to evaluate, counsel, and advise individuals and groups. Others who do this kind of work are psychiatrists, social workers, clergy, special education teachers, and counselors.

## Sources of Additional Information

For information on careers, educational requirements, and financial assistance, contact:

American Psychological Association, Educational Affairs Office, 1200 17th St. NW., Washington, D.C. 20036.

Information on traineeships and fellowships also is available from colleges and universities that have graduate departments of psychology.

# Sociologists

(D.O.T. 054 and 090.227-010)

## Nature of the Work

Sociologists study human society and social behavior by examining the groups that people form. These groups include families, tribes, communities, and governments, as well as a variety of social, religious, political, business, and other organizations. Sociologists study the behavior and interaction of groups and trace their origin and growth and analyze the influence of group activities on individual members. Some sociologists are concerned primarily with the characteristics of social groups and institutions. Others are more interested in the ways individuals are affected by the groups to which they belong.

Fields of specialization for sociologists include social organization, social psychology, rural and urban sociology, racial and ethnic relations, criminology and penology, and industrial sociology. Other important specialties include medical sociology—the study of social factors that affect mental and public health; demography—the study of the size, characteristics, and movement of populations; gerontology—the study of the special problems faced by aged persons in our rapidly changing society; and social ecology—the study of the effect of the physical environment and technology on people.

Sociological research, like other kinds of social science research, involves collecting information, testing its validity, and analyzing the results. Sociologists usually conduct surveys or do case studies in order to gather the data they need. For example, after providing for controlled conditions, a sociologist might test the effects of different styles of leadership on individuals in a small group. A medical sociologist might study the incidence of lung cancer in an area contaminated by industrial pollutants. Sociological researchers also conduct large-scale experiments to test the efficacy of different kinds of social programs. They might test and evaluate particular programs of income assistance, job training, or remedial education. Increasingly, sociologists apply statistical and computer techniques in their research. The results of sociological research aid educators, lawmakers, administrators, and others interested in social problems and social policy. Sociologists work closely with members of other professions including psychologists, physicians, economists, political scientists, anthropologists, and social workers.

Most sociologists are college and university teachers. Like other college faculty, they may conduct research, do consulting work, or handle administrative duties in addition to teaching. (For more information, see the

Sociologist advises local officials on points to consider as they plan for future growth.

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statement on college and university faculty elsewhere in the *Handbook*.)

Some sociologists are primarily administrators. They apply their professional knowledge in areas as diverse as intergroup relations, family counseling, public opinion analysis, law enforcement, education, personnel administration, public relations, regional and community planning, and health services planning. They may, for example, administer social service programs in family and child welfare agencies or develop social policies and programs for government, community, youth, or religious organizations.

A number of sociologists are employed as consultants. Using their expertise and research skills, they advise on such diverse problems as halfway houses and foster care for the mentally ill; ways of counseling ex-offenders; and market research for advertisers and manufacturers. Increasingly, sociologists are involved in the evaluation of social and welfare programs. Some do technical writing and editing.

## Working Conditions

Most sociologists do a lot of desk work, reading and writing reports on their research. Those employed by colleges and universities have flexible work schedules, dividing their time between teaching, research, consulting, and administrative responsibilities. Those working in government agencies and private firms have more structured work schedules, and many experience the pressures of deadlines, tight schedules, heavy workloads, and overtime. Their routine may be interrupted by numerous telephone calls, letters, requests for information, and meetings. Travel may be required to collect data for research projects or attend professional conferences.

## Employment

An estimated 21,000 persons were employed as sociologists in 1980. Colleges and universities employ over two-thirds of all sociologists. A number work for government agencies at all levels and deal with such subjects as poverty, crime, public assistance, population policy, social rehabilitation, community development, mental health, racial and ethnic relations, and environmental impact studies. Sociologists in the Federal Government work primarily for the Departments of Defense, Health and Human Services, Interior, and Agriculture. Some demographers work for international organizations such as the International Bank for Reconstruction and Development, the United Nations, and the World Health Organization. Some persons with training in sociology work as social science analysts, statisticians, and in other positions for Federal agencies.

Some sociologists hold managerial, research, and planning positions in corporations, research firms, professional and trade associations, consulting firms, and welfare or other nonprofit organizations. Others run their own research or consulting businesses.

Since sociology is taught in most institutions of higher learning, sociologists may be found in nearly all college communities. They are most heavily concentrated, however, in large colleges and universities that offer graduate training and opportunities for research in sociology.

## Training, Other Qualifications, and Advancement

The Ph.D. degree is required for appointment to permanent teaching and research positions in colleges and universities and is essential for senior level positions in nonacademic research institutes, consulting firms, corporations, and government agencies. As the academic job market gets tighter during the 1980's, a Ph.D. will be required increasingly for virtually all professional sociologist positions.

Sociologists with master's degrees can qualify for administrative and research positions in public agencies and private businesses, provided they have sufficient training in research, statistical, and computer methods. However, advancement opportunities generally are more limited for master's degree holders than for Ph.D's. Sociologists with master's degrees may qualify for teaching positions in junior colleges and for some college instructorships. Many colleges, however, appoint as instructors only people who have training beyond the master's degree level—frequently the completion of all requirements for the Ph.D. degree except the doctoral dissertation. Although financial aid is increasingly difficult to obtain, some outstanding graduate students may get teaching or research assistantships that provide both financial aid and valuable experience.

Bachelor's degree holders in sociology may get jobs as interviewers or as administrative or research assistants. Many work as social workers, counselors, or recreation workers in public and private welfare agencies. Sociology majors who have sufficient training in statistical and survey methods may qualify for positions as junior analysts or statisticians in business or research firms or government agencies.

About 140 colleges and universities offer doctoral degree programs in sociology; most of these also offer a master's degree. In 160 schools, the master's is the highest degree offered, and about 900 schools have bachelor's degree programs. Sociology departments offer a wide variety of courses including sociological theory, social statistics and quantitative methods, crime and deviance, dynamics of social interaction, sex roles, population, social stratification, social control, small group analysis, urban sociology, social organizations, and sociology of religion, law, the arts, war, politics, education, work and occupations, and mental health.

Some departments of sociology have highly structured programs while others are relatively unstructured and leave course selection largely up to the individual student. Departments have different requirements regarding foreign language skills, courses in statistics, and completion of a thesis for the master's degree.

In the Federal Government, candidates generally need a college degree including 24 semester hours in sociology, with course work in theory and methods of social research. However, since competition for the limited number of positions is so keen, advanced study in the field is highly recommended.

The choice of a graduate school is important for people who want to become sociologists. Students should select schools that have adequate research facilities and offer appropriate areas of specialization such as theory, demography, or quantitative methods. Opportunities to gain practical experience also may be available, and sociology departments frequently help place students in business firms and government agencies.

The ability to handle independent research is important for sociologists. Intellectual curiosity is an essential trait; researchers must have inquiring minds and a desire to find explanations for the phenomena they observe. Like other social scientists, sociologists must be objective in gathering information about social institutions and behavior; they need analytical skills in order to organize data effectively and reach valid conclusions; and they must be careful and systematic in their work. Because communicating their findings to other people is such an important part of the job, sociologists must be able to formulate the results of their work in a way that others will understand. The ability to speak well and to write clearly and concisely is a "must" in this field.

## Job Outlook

Employment of sociologists is expected to increase more slowly than the average for all occupations through the 1980's. Most openings will result from deaths, retirements, and other separations from the labor force. This will be particularly true in colleges and universities where the basic determinant of demand for college faculty is enrollment. College enrollments are expected to decline during the 1980's. This almost certainly would mean some decrease in employment of college faculty over the period. Some academic openings may result from the growing trend to add sociology courses to the curriculums of other academic disciplines, such as medicine, law, business administration, and education. Demand in the nonteaching area will center around the increasing involvement of sociologists in the evaluation and administration of programs designed to cope with social and welfare problems.

The number of persons who graduate with advanced degrees in sociology through the 1980's is likely to exceed greatly the available job openings. Graduates with a Ph.D. face increasing competition, particularly for academic positions, although those with degrees from the most outstanding institutions may have an advantage in securing teaching jobs. Academic institutions increasingly seek

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persons qualified to perform a dual role: Teach and also conduct applied research in a university-affiliated organization such as a center for environmental studies. Job search time for new graduates seeking academic jobs will be longer than in the past, and some Ph.D.'s may accept temporary, part-time positions as instructors.

An increasing proportion of Ph.D.'s are expected to enter nonacademic careers. Some may find research and administrative positions in government, corporations, research organizations, and consulting firms. Those well trained in quantitative research methods, including survey techniques, advanced statistics, and computer science, will have the widest choice of jobs. For example, private firms that contract with the government to evaluate social programs and conduct other research increasingly seek sociologists with strong quantitative skills. Demand is expected to be strong for those with training in applied sociology, including such areas as criminology, deviant behavior, medical sociology, social gerontology, and demography. For example, international organizations such as the United Nations and the International Bank for Reconstruction and Development are expected to seek additional demographers to help underdeveloped countries formulate long range public planning programs. Sociologists with training in other applied disciplines, such as public policy, public administration, and business administration, will be attractive to employers seeking managerial and administrative personnel.

Persons with a master's degree will continue to face very keen competition for academic positions, although some may find jobs in junior and community colleges. They also will face strong competition for the limited number of sociologist positions open to them in nonacademic settings. Some may find research and administrative jobs in government, research firms, and corporations. For example, sociologists with backgrounds in business and quantitative research methods may find opportunities in marketing research firms.

Bachelor's degree holders will find few opportunities for jobs as professional sociologists. As in the past, many graduates will take positions as trainees and assistants in government, business, and industry. As with advanced degree holders, training in quantitative research methods provides these graduates with the most marketable skills. Some may find positions in social welfare agencies. For those planning to continue their studies in law, journalism, social work, recreation, counseling, and other related disciplines, sociology provides an excellent background. Some who meet State certification requirements may enter high school teaching.

### Earnings

According to a 1979 survey by the National Research Council, the median annual salary of all doctoral social scientists (including sociologists) was $26,000. For those in educational institutions, it was $25,600; in the Federal Government, $34,400; in nonprofit organizations, $28,300; and in business and industry, $33,600.

The Federal Government recognizes education and experience in certifying applicants for entry level positions. In general, the entrance salary for sociologists with a bachelor's degree was about $12,300 or $15,200 a year in early 1981, depending upon the applicant's academic record. The starting salary for those with a master's degree was about $18,600 a year, and for those with a Ph.D., about $22,500. Sociologists in the Federal Government averaged around $28,400 a year in 1980.

In general, sociologists with the Ph.D. degree earn substantially higher salaries than those without the doctoral degree. Many sociologists, particularly those employed by colleges and universities for the academic year, supplement their regular salaries with earnings from other sources, such as summer teaching and consulting work.

### Related Occupations

Sociologists are not the only people whose jobs require an understanding of social processes and institutions. Others whose work demands such expertise include anthropologists, economists, geographers, historians, political scientists, psychologists, urban and regional planners, market research analysts, newspaper reporters and correspondents, and social workers.

### Sources of Additional Information

Additional information on careers, job openings, and graduate departments of sociology is available from:

American Sociological Association, Career and Research Division, 1722 N St. NW., Washington, D.C. 20036.

For information about careers in demography, contact:

Population Association of America, 806 15th St. NW., Suite 640, Washington, D.C. 20005.

## Urban and Regional Planners

(D.O.T. 199.167-014)

### Nature of the Work

Urban and regional planners, often called community or city planners, develop programs to provide for future growth and revitalization of urban, suburban, and rural communities. They help local officials make decisions to solve social, economic, and environmental problems.

Planners examine community facilities such as health clinics and schools to be sure these facilities can meet the demands placed upon them. They also keep abreast of the legal issues involved in community development or redevelopment and changes in housing and building codes. Because suburban growth has increased the need for better ways of traveling to the urban center, the planner's job often includes designing new transportation systems and parking facilities.

Urban and regional planners prepare for situations that are likely to develop as a result of population growth or social and economic change. They estimate, for example, the community's long-range needs for housing, transportation, and business and industrial sites. Working within a framework set by the community government, they analyze and propose alternative ways to achieve more efficient and attractive urban areas.

Before preparing plans for long-range community development, urban and regional planners prepare detailed studies that show the current use of land for residential, business, and community purposes. These reports include such information as the location of streets, highways, water and sewer lines, schools, libraries, and recreational sites. They also provide information on the types of industries in the community, characteristics of the population, and employment and economic trends. With this information, urban and regional planners propose ways of using undeveloped land and design the layout of recommended buildings and other facilities such as subway stations. They also prepare materials that show how their programs can be carried out and what they will cost.

Urban and regional planners often confer with land developers, civic leaders, and other public planning officials. They may prepare materials for community relations programs, speak at civic meetings, and appear before legislative committees to explain their proposals.

In large organizations, planners usually specialize in areas such as physical design, community relations, and the renovation or reconstruction of rundown business districts. In small organizations, planners must be able to do several kinds of work.

### Working Conditions

Urban and regional planners spend most of their time in offices. To be familiar with areas that they are developing, however, they occasionally spend time outdoors examining the features of the land under consideration for development, its current use, and the types of structures existing on it. Although most planners have a scheduled 40-hour workweek, they sometimes must attend evening or weekend meetings or public hearings with citizens' groups.

### Employment

About 23,000 persons were urban and regional planners in 1980. Most work for city, county, or regional planning agencies. A number are employed by State or Federal agencies dealing with housing, transportation, or environmental protection.

Many planners do consulting work, either part time in addition to a regular job, or full time for a firm that provides services to pri-

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vate developers or government agencies. Planners also work for large land developers or research organizations and teach in colleges and universities.

## Training, Other Qualifications, and Advancement

Employers often seek workers who have advanced training in urban or regional planning. Most entry jobs in Federal, State, and local government agencies require 2 years of graduate study in urban or regional planning, or the equivalent in work experience. Although the master's degree in planning is the usual requirement at the entry level, some people who have a bachelor's degree in city planning, architecture, landscape architecture, or engineering may qualify for beginning positions.

In 1980, over 75 colleges and universities offered a master's degree in urban or regional planning. Although students holding a bachelor's degree in architecture or engineering may earn a master's degree after 1 year, most graduate programs in planning require 2 or 3 years. Graduate students spend considerable time in workshops or laboratory courses learning to analyze and solve urban and regional planning problems and often are required to work in a planning office part time or during the summer.

Candidates for jobs in Federal, State, and local government agencies usually must pass civil service examinations to become eligible for appointment.

Planners must think in terms of spatial relationships and visualize the effects of their plans and designs. They should be flexible and able to reconcile different viewpoints to make constructive policy recommendations.

After a few years' experience, urban and regional planners may advance to assignments requiring a high degree of independent judgment such as designing the physical layout of a large development or recommending policy, program, and budget options. Some are promoted to jobs as planning directors and spend a great deal of time meeting with officials in other organizations, speaking to civic groups, and supervising other professionals. Advancement beyond planning director is difficult and often occurs only through a transfer to a large city with more complex problems and greater responsibilities.

## Job Outlook

Employment of urban and regional planners is expected to increase faster than the average for all occupations through the 1980's due to the growing importance of environmental, economic, and energy planning. Increased interest in zoning and land-use planning in undeveloped areas, including coastal areas, should spur demand for planners. Expected population growth in suburban locations and in the South and West should increase the workload of zoning and planning agencies and may result in demand for additional planners. Opportunities also are expected to arise in health systems agencies that regulate the growth of primary care facilities. In addition, some jobs will open up because of the need to replace planners who will die, retire, or transfer to other occupations.

However, in recent years, qualified applicants have exceeded openings in urban or regional planning, and the situation is expected to persist unless fewer degrees are awarded through the 1980's. Budgetary restraints in government may also adversely affect employment. As a result, some persons trained as planners will have to accept jobs in other areas of public administration.

Graduates of prestigious academic institutions should have the best job prospects. With increasing competition, geographic mobility and the willingness to work in small towns or rural areas are important for many job seekers.

Urban and regional planners need to know a community in order to plan for its long-range needs.

## Earnings

Based on a survey by the American Planning Association, urban and regional planners earned a median annual salary of about $24,000 in early 1980. City, county, and other local governments paid urban and regional planners median salaries of more than $22,000 a year in early 1980. Salaries varied slightly according to the size of the jurisdiction. Planners employed by the largest jurisdictions earned almost $24,000, while those employed by the smallest jurisdictions earned about $19,000. Planning directors earned median salaries of about $27,000 a year in 1980. Salaries of planning directors varied significantly according to the size of the jurisdiction. Directors employed by large cities earned about $32,500, while those employed by small cities earned less than $20,000. Most planners have sick leave and vacation benefits and are covered by retirement and health plans.

State governments paid urban and regional planners average beginning salaries of about $13,800 a year in mid-1980, although planners started at more than $20,000 in the States of Alaska and Utah. Salaries of experienced State planners ranged from an average minimum of nearly $20,300 a year to an average maximum of more than $27,500 a year. Salaries of State planning directors ranged from an average minimum of about $30,800 to an average maximum of nearly $37,600 in mid-1980.

Planners with a master's degree were hired by the Federal Government at about $18,600 a year in early 1981. In some cases, persons having less than 2 years of graduate work could enter Federal service as interns at yearly salaries of about $12,300 or $15,200. Salaries of urban and regional planners employed by the Federal Government averaged $31,100 a year in 1980.

## Related Occupations

Urban and regional planners develop plans for the orderly growth of urban and rural communities. Others whose work requires planning include architects, landscape architects, city managers, and planning engineers.

## Sources of Additional Information

Facts about careers in urban and regional planning and a list of schools offering training and job referrals are available from:

American Planning Association, 1776 Massachusetts Ave. NW., Washington, D.C. 20036.

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# Social and Recreation Workers

Those considering a career in social work or recreation should be "people-oriented," for helping people is what the work is all about. Social workers and recreation workers use a variety of techniques to help people cope with crises or live fuller lives.

Social workers assist individuals and families whose lives are being torn apart by poverty, alcoholism, drug abuse, behavior problems, or illness. They find families to adopt or provide foster care for children whose parents can't take care of them; see to it that needy families are able to give their children proper food, health care, and schooling; and step in when there is evidence of parental neglect or abuse. *School social workers* help students who have severe personal or family problems. *Group workers* give young people guidance and support so that they will learn to deal with their changing lives and develop into responsible adults. Some social workers do corrections work, counseling juvenile delinquents and serving as *probation officers* or *parole officers*. *Medical social workers* counsel hospital patients and advise the family as well—perhaps suggesting ways of arranging for home care after the patient leaves the hospital. *Psychiatric social workers*, usually employed in hospitals, clinics, or mental health centers, help patients respond to their treatment and serve as a link with the family and the community at large.

Growing attention is being given within the profession to directing and influencing social change. Social planners work with health, housing, transportation, and other planners to suggest ways of making our communities more wholesome places to live. Social workers use various forms of direct action to help people deal with some of the basic forces that shape their lives. They may, for example, do research to identify community needs; draft legislation; or comment on government proposals in such areas as housing, health, and social and welfare services. Or they may help organizations in the community work for social betterment.

*Recreation workers*, too, help individuals and groups in a number of different ways. They develop and supervise activity programs for children, teenagers, and adults. Some specialize in therapeutic recreation, and plan and coordinate activities for people who are handicapped, emotionally disturbed, or chronically ill. Like others in the helping professions, recreation workers often operate on a team basis with other professionals including therapists, nurses, physicians, social workers, counselors, and educators.

People enter professional positions in social work and recreation from a variety of backgrounds. To a certain extent, an applicant's formal education determines the amount of responsibility he or she is given and affects advancement opportunities as well. An MSW (master's in social work) is preferred or required for many social work positions, while a college degree with a major in recreation is increasingly important for those aspiring to a career in recreation or leisure services. In both fields, however, training is offered at the associate, bachelor's, master's, and Ph.D. levels. Ordinarily, a candidate with an associate degree would be offered a job as an activity leader or casework aide, while someone with a Ph.D. would be considered for a position in teaching, research, or administration. But the job market does not always operate as predictably as this; actual hiring decisions vary from time to time and place to place. Experience, or academic training in a related field, may be the decisive consideration.

During the 1980's, employment growth in the human services area will respond to budget constraints, and new graduates are likely to experience competition for jobs. However, the job market will be more "crowded" in some fields of specialization and some parts of the country than in others. More detailed information about job outlook appears in the statements that follow.

## Social Workers

(D.O.T. 195.107-010 through -038; .137-010; .164-010; .167-010, -014, -030, -034, and .267-014)

### Nature of the Work

Social workers are community troubleshooters. Through direct counseling or referral to other services, they help individuals, families, and groups cope with their problems.

The nature of the problem and the time and resources available determine which of three traditional approaches—casework, group work, and community organization—social workers will use. Social workers who specialize in social planning and policy use another approach; they help people effect change in social institutions such as health services, housing, or education, or tackle social problems such as drug abuse or racial antagonism.

In casework, social workers interview individuals and families to understand their problems and secure the appropriate resources, services, education, or job training. In group work, social workers help people understand themselves and others to achieve a common goal. They plan and conduct activities for children, teenagers, adults, older persons, and other groups in community centers, hospitals, nursing homes, and correctional institutions. In community organization, social workers coordinate the efforts of political, civic, religious, business, and union organizations to combat social problems through community programs. For a neighborhood or larger area, they may help plan and develop health, housing, welfare, and recreation services. Social workers often coordinate existing services, organize fund raising for community social welfare activities, and aid in developing new community services.

Social workers who specialize in family and child services counsel individuals, work to strengthen personal and family relationships, and help clients cope with problems. They provide information and referral services in many areas—family budgeting and money management, locating housing, homemaker assistance for the elderly, job training, and day care for parents trying to support a family.

Social workers who specialize in child welfare seek to improve the physical and emotional well-being of children and youth. They may advise parents on child care and child rearing, counsel children and youth with social adjustment difficulties, and arrange homemaker services during a parent's illness. Social workers may institute legal action to protect neglected or mistreated children, help unmarried parents, and counsel couples about adoption. After proper evaluation and home visits, they may place and oversee children in foster homes or institutions. If these children have serious problems in school, child welfare workers may consult with parents, teachers, counselors, and others to identify the underlying problems.

Medical social workers and psychiatric social workers are trained to help patients and their families with social problems that may accompany illness, recovery, and rehabilitation. They work in hospitals, clinics, community mental health centers, rehabilitation centers, and nursing homes. Renal social workers (who deal with patients and families of patients suffering from kidney disease) and social workers specializing in drug addiction help patients readjust to their homes, jobs, and communities. Counselors, psychologists, psychiatrists, and nurses with specialized training also help patients and their families cope with social problems resulting from serious illness. These occupations are described elsewhere in the *Handbook*.

A growing number of social workers specialize in the field of aging. They plan and evaluate services for the elderly, and help older persons and their families deal with difficulties brought about by diminished capacities and changed circumstances. In nursing homes, for example, they help patients

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Job opportunities for social workers are best in the Sunbelt and rural areas.

and their families adjust to the need for long-term institutional care.

Social workers and probation or parole officers in correctional institutions and correctional programs help offenders readjust to society. They counsel on the social problems that arise on returning to family and community life, and also may help secure necessary education, training, employment, or community services.

## Working Conditions

Most social workers have a 5-day, 35- to 40-hour week. However, many, particularly in private agencies, work part time. Many work evenings and weekends to meet with clients, attend community meetings, and handle emergency situations. Compensatory time generally is granted for overtime. Because social workers often must visit clients or attend meetings, the ability to drive a car often is necessary.

## Employment

About 345,000 social workers were employed in 1980. Two out of three were employed in the public sector. Most of these worked for State, county, or municipal governments; relatively few worked for the Federal Government. Social workers are employed primarily in departments of human resources, health, housing, education, and corrections. Those in the private sector work for voluntary nonprofit agencies; community and religious organizations; hospitals, nursing homes, and home health agencies; and other human service agencies.

Some are employed in business and industry, as "industrial social workers." They are located, organizationally, in the personnel department or health unit, and they support employee productivity and quality of life through counseling, educational programs, and referral to community social programs. Industrial social workers might, for example, counsel employees whose performance is affected by emotional problems, alcoholism, or drug abuse.

A small but growing number of social workers are in private practice.

Although employment is concentrated in urban areas, many work with rural families. A small number of social workers—employed by the Federal Government and the United Nations or one of its affiliated agencies—serve in other parts of the world as consultants, teachers, or technicians and establish agencies, schools, or assistance programs.

## Training, Other Qualifications, and Advancement

The bachelor's degree in social work (BSW) usually is accepted as the minimum education of the professional social worker. BSW programs generally provide instruction in social work practice, social welfare policies and service, human behavior and the social environment, and social research. Supervised field experience is required.

BSW programs prepare graduates for direct service positions such as case worker or group worker. Formal training in social work is not always essential for an entry level job in the field, however. In many agencies, casework is performed by individuals who have degrees in the liberal arts or humanities, sociology and psychology being the most prevalent majors. Hiring for positions in public agencies usually is subject to State or local merit system requirements. Applicants may have to take a written examination, and their test scores (not their academic credentials) determine whether or not they are selected for consideration.

For some entry level positions, an MSW degree is preferred or required. Furthermore, an MSW is a decided asset for advancement to a supervisory position. Two years of specialized study including a period of supervised field instruction, or internship, generally are required to earn an MSW. Field placement affords an opportunity to test one's suitability for social work practice. At the same time, the student may develop expertise in a specialized area and make personal contacts that later are helpful in securing a permanent job. Previous training in social work is not required for entry into a graduate program, but courses such as psychology, sociology, economics, political science, history, social anthropology, and urban studies, as well as social work, are recommended. Some graduate schools offer accelerated MSW programs for a limited number of highly qualified BSW recipients. However, applicants to graduate programs in social work may face keen competition.

In 1980, about 300 colleges and universities offered accredited undergraduate programs and about 90 offered accredited graduate programs in social work. A growing number of programs include courses in gerontology, the study of aging. Graduate students may specialize in clinical social work, community organization, administration, teaching, research, social policy planning, and a variety of other areas.

A limited number of scholarships and fellowships are available for graduate education. A few social welfare agencies grant workers "educational leave" to obtain graduate education.

Advancement usually takes the form of promotion to supervisor, administrator, or director, although some social workers with advanced degrees go into teaching, research, or consulting. Like other administrators, directors of social service agencies hire, train, and supervise staff, develop and evaluate agency programs, make budget decisions, solicit funds, and represent the agency in public.

A graduate degree and experience generally are required for supervisory, administrative, or research work; the last also requires training in social science research methods. Many administrators have a background in social work, business or public administration, education, or health administration. For teaching positions, an MSW is required and a doctorate usually is preferred.

In 1981, 26 States had licensing or registration laws regarding social work practice and the use of professional titles. Usually work experience, an examination, or both, are necessary for licensing or registration, with periodic renewal required. The National Association of Social Workers allows the use of the title ACSW (Academy of Certified Social Workers) for members who have earned a master's degree, passed the ACSW examination, and gained at least 2 years of job experience. In view of the trend towards specialization at advanced levels of social

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work practice, efforts are being made to devise specialized examinations in addition to the general ACSW examination currently given.

Social workers should be emotionally mature, objective, and sensitive, and should possess a basic concern for people and their problems. They must be able to handle responsibility, work independently, and maintain good working relationships with clients and coworkers.

During high school and college, students should do volunteer, part-time, or summer work to determine whether they have the interest and capacity for professional social work. Some voluntary and public social welfare agencies occasionally hire students as assistants to social workers.

## Job Outlook

Employment of social workers is expected to increase about as fast as the average for all occupations through the 1980's. Some expansion of social services is likely, especially in health-related services in hospitals, nursing homes, community mental health centers, and home health agencies; in programs for the aging; and in personal and family counseling. Relatively high levels of unemployment coupled with problems caused by social change are expected to sustain a strong need for persons in the social service field. Social workers will also be needed to assist professionals in other fields, such as transportation, law, and public administration. In addition to jobs resulting from growth in demand for social services, many openings will result from replacement needs.

Job prospects for social workers vary a great deal. Opportunities depend to some extent upon academic credentials—whether or not an applicant has formal social work training, and preferably an MSW—but geographic location is probably the most important consideration.

Competition is keen in cities where training programs for social workers abound, such as Boston and New York. This competition is certain to intensify if social service programs in those localities are cut back in response to budget pressures on State and local governments. At the same time, population growth in the Sunbelt States is spurring expansion of social service programs there, and some isolated rural areas find it difficult to attract and retain qualified staff.

Although graduates having a BSW are reported to be faring well in the job market, they do not necessarily have an advantage over other college graduates in the search for entry level jobs. Jobs covered by civil service regulations usually are filled through competitive examination, and an applicant's undergraduate major is not a determining factor in the selection.

Graduates of MSW and doctoral degree programs are qualified for a wider range of jobs, including planning, administration, research, and teaching. The outlook for those graduates is expected to be favorable throughout the 1980's, although some may have to relocate.

## Earnings

Salaries for social workers at all levels vary greatly by type of agency (private or public: Federal, State, or local) and geographic region, but generally are highest in large cities and in States with sizable urban populations. Private practitioners, administrators, teachers, and researchers often earn considerably more than social workers in other settings.

Starting salaries for social case workers (positions requiring a BSW) in State and local governments averaged about $12,000 in 1980, according to a survey conducted by the U.S. Office of Personnel Management; for social service supervisors, the average starting salary was $15,900.

The average annual starting salary for social workers (positions requiring an MSW and 1 year of related experience) in hospitals and medical centers was about $16,300 in 1981, according to a survey conducted by the University of Texas Medical School. Top salaries for experienced social workers in these settings averaged $21,100.

In the Federal Government, social workers with an MSW and no other experience started at $18,585 in early 1981; average earnings for social workers in the Federal service were $25,200. Graduates with a Ph.D. or job experience may start at a higher salary. Most social workers in the Federal Government are employed by the Veterans Administration and the Departments of Health and Human Services, Education, Justice, and Interior.

## Related Occupations

Through direct counseling or referral to other services, social workers help people solve a range of personal problems. Workers in occupations with similar duties include: Case aides, members of the clergy, counselors, counseling psychologists, and vocational rehabilitation counselors.

## Sources of Additional Information

For information about career opportunities in social work, contact:

National Association of Social Workers, 1425 H St. NW., Suite 600, Southern Building, Washington, D.C. 20005.

The Council on Social Work Education publishes an annual *Directory of Accredited BSW Programs* and *Directory of Accredited MSW Programs*, which may be purchased for $1.20 each, postpaid. These and other publications are available from:

Council on Social Work Education, 111 Eighth Ave., New York, N.Y. 10017.

# Recreation Workers

(D.O.T. 159.124-010; 187.137-010; 195.167-018, .227-010 and -014; 352.167-010)

## Nature of the Work

Participation in organized recreation is more important today than ever before as people find the amount of leisure time in their lives increasing. Recreation workers plan, organize, and direct individual and group activities that help people enjoy their leisure hours. They work with people of all ages and socioeconomic levels; the sick and the well; and the emotionally and physically handicapped. Their employment settings range from the wilderness to rural to suburban and urban, including the inner city.

Recreation personnel employed by local governments and voluntary agencies provide leisure-time activities at outdoor neighborhood playgrounds and indoor recreation centers. They furnish instruction in the arts, crafts, and sports. They may supervise recreational activities at correctional institutions or work closely with social workers to organize programs for the young and the aged. School recreation staff organize the leisure-time activities of school-age children during schooldays, weekends, and vacations.

Under the supervision of a camp director, camp counselors lead and instruct campers in nature-oriented forms of recreation such as swimming, hiking, and horseback riding as well as outdoor education. They also provide campers with specialized instruction in a particular area such as music, drama, gymnastics, or tennis. In resident camps, the staff also must insure that the campers have adequate living conditions.

Recreation personnel in industry and in the Armed Forces organize and direct activities in recreation rooms, athletic programs such as bowling and softball leagues, social functions, and other leisure activities for company employees and service men and women.

Therapeutic recreation is a rapidly growing specialized field designed to help individuals recover or adjust to illness, disability, or specific social problems. Recreational therapists work in hospitals, correctional institutions, health and rehabilitation centers, nursing homes, and private schools and camps for the mentally retarded, emotionally disturbed, and physically handicapped. Therapeutic recreation workers, in conjunction with physicians, prescribe activities on a one-to-one basis.

Recreation workers occupy a variety of positions at different levels of responsibility. *Recreation leaders* provide face-to-face leadership and are responsible for a recreation program's daily operation. They may give instruction in crafts, games, and sports, keep records, and maintain recreation facilities. Recreation leaders who give instruction in specialties such as art, music, drama, swimming, or tennis are called *activity specialists*. They often conduct classes and coach teams in the activity in which they specialize. A camp counselor is generally a recreation leader and may also be an activity specialist. Recreation leaders usually work under the direction of a supervisor.

*Recreation supervisors* plan programs to meet the needs of the population they serve; supervise recreation leaders, sometimes over

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Volunteer experience can lead to a full-time job as an activity director.

an entire region; and direct specialized activities.

*Recreation administrators* or *directors* manage recreation programs. They have overall responsibility for program planning, budget, and personnel.

## Working Conditions

While the average week for recreation workers is 35-40 hours, people entering this field should expect some night work and irregular hours. In addition, workers often spend much of their time outdoors when the weather permits.

Recreation workers are employed mostly in urban areas where many people must use the same playgrounds and recreation centers. Camp workers, however, often work in rural, less populated areas of the country. Some camp workers live at the camp and their room and board are part of their compensation.

## Employment

About 135,000 persons worked as group recreation workers and camp directors in 1980. (This employment estimate does not include many summer workers.) About 40 percent worked for government agencies, primarily local recreation departments. These included over 2,000 municipal park and recreation departments, over 1,200 county park and recreation agencies, about 350 special districts, and the State park systems. Several thousand persons worked for the Federal Government as recreation specialists, sports specialists, outdoor recreation planners, and recreation assistants and aides. They worked primarily for the Veterans Administration and the Departments of Defense and Interior.

Another 25 percent worked for civic, social, and fraternal associations, primarily Boy Scout, Girl Scout, and other youth associations. Others worked for health service facilities, social service organizations, religious organizations, senior centers and retirement communities, and large business firms.

Many jobs for recreation workers are found in private and commercial recreation—including amusement parks, sports and entertainment centers, wilderness and survival enterprises, tourist attractions, vacation excursions, hotels and other resorts, camps, health spas, athletic clubs, apartment complexes, and other settings.

The recreation field is characterized by an unusually large number of part-time, seasonal, and volunteer jobs. Some volunteers serve on local park and recreation boards and commissions. The vast majority, however, serve as volunteer activity leaders at local playgrounds, or in youth organizations, camps, nursing homes, hospitals, senior centers, and other settings. Many recreation professionals have found that volunteer experience, as well as part-time work during school, can lead directly to a full-time job. The largest number of paid employees in the recreation field are part-time or seasonal workers. Typical jobs include summer camp counselors and playground leaders, lifeguards, craft specialists, and after-school and weekend recreation program leaders. Many of these jobs are filled by teachers and college students.

## Training, Other Qualifications, and Advancement

A college degree with a major in parks and recreation is an increasingly important qualification for those seeking full-time career positions in the recreation field. Generally, an applicant's level of formal education and training determines the type of job he or she can get.

A number of recreation leader positions currently are filled by high school graduates. However, those seeking jobs with career potential should obtain a minimum of an associate degree. Some jobs as recreation leader require specialized training in a particular field, such as art, music, drama, or athletics. Most supervisors have a bachelor's degree plus experience. Persons with a degree in parks and recreation have better prospects for career advancement.

A bachelor's degree and experience are considered minimum requirements for administrators. However, increasing numbers are obtaining master's degrees in parks and recreation as well as in related disciplines. Many persons with backgrounds in other disciplines, including social work, forestry, and resource management, pursue graduate degrees in recreation.

In industrial recreation, companies seeking recreation directors prefer applicants with a minimum of a bachelor's degree in recreation with a strong background in business administration. While a bachelor's degree in recreation or education is generally the minimum requirement for the job of camp director, a master's degree is often preferred.

Requirements for college faculty in the parks and recreation field vary according to the type of institution. Based on a survey by the National Recreation and Park Association (NRPA), about two-thirds of junior college faculty had a master's, one-fifth had a bachelor's, and one-tenth had a Ph.D. degree; over one-half of senior college faculty had a Ph.D. degree and the remainder had a master's degree.

In 1980, about 210 2-year community colleges offered associate degree recreation leadership and park technician programs; 295 4-year colleges and universities offered park and recreation curriculums. In addition, about 120 master's degree programs and over 20 doctoral programs were offered. Programs in therapeutic recreation were offered by about 40 community and junior colleges and 125 4-year colleges and universities. A number of graduate programs also were offered.

The NRPA presently accredits park and recreation curriculums at the bachelor's and master's degree levels and is beginning a

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process of accrediting 2-year associate degree programs. Students in accredited bachelor's degree programs devote about one-half of their time to general education courses in which they may gain knowledge of the natural and social sciences including an understanding of human growth and development and of people as individuals and as social beings; history and appreciation of human cultural, social, intellectual, spiritual, and artistic achievements; and other areas of interest. One-fourth of their time involves exposure to professional park and recreation education including history, theory, and philosophy; community organization; recreation and park services; leadership supervision and administration; understanding of special populations such as the elderly or handicapped; and fieldwork experience. Students spend the remainder of their time developing competencies in specialized professional areas such as therapeutic recreation (courses in psychology, health, education, and sociology are recommended), park management, outdoor recreation, park and recreation administration, industrial or commercial recreation (courses in business administration are recommended), camp management, and other areas.

The American Camping Association has developed a curriculum for camp director education which is utilized by many colleges and universities. Many of the national youth associations offer training courses for camp directors at the local and regional level.

Persons planning recreation careers must be good at motivating people and sensitive to their needs. Good health and physical stamina are required. Activity planning calls for creativity and resourcefulness. Willingness to accept responsibility and the ability to exercise judgment are important qualities since recreation personnel often work alone. To increase their leadership skills and understanding of people, students are advised to obtain related work experience in high school and college. Opportunities for part-time, summer, or after-school employment, or for volunteer work, may be available in local park and recreation departments, youth service agencies, religious or welfare agencies, nursing homes, camps, parks, or nature centers. Such experience may help students decide whether their interests really point to a human service career. Students also should talk to local park and recreation professionals, school guidance counselors, and others.

After a few years of experience, recreation leaders may become supervisors. Although promotion to administrative positions may be easier for persons with graduate training, advancement usually is possible through a combination of education and experience.

NRPA has developed national registration standards for professional and technical personnel, including both education and experience requirements. Over 30 States have adopted these standards. The American Camping Association certifies camp directors based upon experience and knowledge of the field.

As of mid-1981, Utah and Georgia had mandatory licensing requirements for therapeutic recreation workers. More States are expected to adopt such requirements in the coming years. Therapeutic recreation workers in long-term care facilities must be registered by the NRPA, National Therapeutic Recreation Society's Board of Registration, or by the State in which they work.

## Job Outlook

Employment of group recreation workers and camp directors is expected to grow about as fast as the average for all occupations through the 1980's as more people engage in recreation activities during their increased leisure time; as the number of older people using senior centers and nursing homes increases; and as additional recreation sites are constructed to serve the needs of an expanding population. In addition to jobs created by growth in demand for these workers, there will be many openings annually from the need to replace recreation workers who transfer to other occupations, retire, or die.

The job outlook for group recreation workers is largely dependent on government funding for recreation services. In recent years, austerity budgets have been adopted by governments at all levels—a situation which is likely to continue. Furthermore, the number of applicants for full-time positions in the recreation field is likely to exceed available job openings. As a result, competition for jobs as recreation workers is expected to be keen, particularly in public recreation agencies. Persons with formal training and experience in parks and recreation are expected to have the best job opportunities in this field; those with graduate degrees should have the best opportunities for supervisory and administrative positions.

Job opportunities are expected to be more favorable in therapeutic recreation and private and commercial recreation. Opportunities for specially trained therapeutic recreation workers are likely to be favorable, in line with the anticipated need for additional staff in many health service facilities. By contrast, competition for jobs as camp directors is expected to be very keen.

Job experience prior to graduation will greatly help a graduate find a position. Although competition is expected to be keen, many opportunities for part-time and summer employment will be available for recreation leaders in local government recreation programs. Many of the summer jobs will be for counselors and craft and athletic specialists in camps.

## Earnings

According to a 1980 survey by the International Personnel Management Association, State governments paid recreation program leaders with a bachelor's degree average beginning salaries of about $11,500; experienced workers, about $15,800. Municipalities paid program leaders average beginning salaries of about $13,000; experienced workers, about $17,000.

According to NRPA, 2-year associate degree graduates received starting salaries ranging from $7,000 to $10,000 in 1981. Individuals with bachelor's degrees obtained park and recreation positions with annual salaries that were in the $10,000 to $13,000 range. Persons with graduate degrees generally received higher salaries. Supervisors' salaries ranged from $15,000 to $20,000. The average salary for chief administrators in public park and recreation agencies was about $25,000, and ranged up to $55,000. All salaries varied widely depending on the size and type of employing agency and geographic location.

According to the American Camping Association, the average annual starting salary for camp directors was about $15,000 in 1980. Salaries for experienced camp directors ranged from $12,000 to $30,000 a year.

The average annual starting salary for recreational therapists (positions requiring a college degree in recreational therapy or a related field) in hospitals and medical centers was about $13,000 in 1980, according to a survey conducted by the University of Texas Medical School. Top salaries for experienced recreational therapists in these settings averaged $16,200, and some were as high as $22,900.

Starting salaries for recreation and park professionals in the Federal Government in early 1981 were about $12,300 for applicants with a bachelor's degree; $15,200 for those with a bachelor's degree plus 1 year of experience; $18,600 for those with a bachelor's plus 2 years' experience or a master's degree; and $22,500 for those with a bachelor's plus 3 years' experience or a Ph.D. Recreation and park assistants, aides, and technicians earn less than these professionals.

Most public and private recreation agencies provide vacation and other fringe benefits such as sick leave and hospital insurance.

## Related Occupations

Recreation workers must exhibit leadership and sensitivity in dealing with people. Other occupations that require similar personal qualities include social workers, parole officers, human relations counselors, school counselors, clinical and counseling psychologists, and teachers.

## Sources of Additional Information

Information about recreation as a career, employment opportunities in the field, colleges and universities offering park and recreation curricula, accreditation, and registration standards is available from:

National Recreation and Park Association, Division of Professional Services, 3101 Park Center Drive, Alexandria, Va. 22302.

For information on careers in industrial recreation, contact:

National Industrial Recreation Association, 20 North Wacker Dr., Chicago, Ill. 60606.

For information on careers in camping and job referrals, send request and postpaid return envelope to:

American Camping Association, Bradford Woods, Martinsville, Ind. 46151.

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# Religious Workers

Most religious workers are members of the clergy. Deciding on a career in the clergy involves considerations different from those involved in other career choices. When persons choose to enter the ministry, priesthood, or rabbinate, they do so primarily because they possess a strong religious faith and a desire to help others. Nevertheless, it is important to know as much as possible about the profession and how to prepare for it, the kind of life it offers, and its needs for personnel.

The number of clergy needed depends largely on the number of people who participate in organized religious groups. This affects the number of churches and synagogues established and pulpits to be filled. In addition to the clergy who serve congregations, many others teach or act as administrators in seminaries and in other educational institutions; still others serve as chaplains in the Armed Forces, industry, correctional institutions, hospitals, or on college campuses; or render service as missionaries or in social welfare agencies.

Persons considering a career in the clergy should seek the counsel of a religious leader of their faith to aid in evaluating their qualifications. The most important of these are a deep religious belief and a desire to serve the spiritual needs of others. Priests, ministers, and rabbis also are expected to be models of moral and ethical conduct. A person considering one of these fields must realize that the civic, social, and recreational activities of a member of the clergy often are influenced and restricted by the customs and attitudes of the community.

The clergy should be sensitive to the needs of others and able to help them deal with these needs. The job demands an ability to speak and write effectively, to organize, and to supervise others. The person entering this field also must enjoy studying because the occupation requires continuous learning and demands considerable initiative and self-discipline.

In addition to the clergy, some lay people are religious workers. Many coordinate the activities of various denominational groups to meet the religious needs of students or direct religious school programs designed to promote religious education among members of their faith. Like members of the clergy, they sometimes provide counseling and guidance on marital, health, financial, and religious problems.

Education and training requirements as well as job prospects for the clergy vary widely among the faiths and even among branches within some faiths. A detailed discussion of training requirements, job prospects, and other information on the clergy in the three largest faiths in the United States—Protestant, Roman Catholic, and Jewish—is presented in the following statements. Information on the clergy in other faiths and on lay religious workers may be obtained directly from leaders of the respective groups.

## Protestant Ministers

(D.O.T. 120.007-010)

### Nature of the Work

Protestant ministers lead their congregations in worship services and administer the various rites of their churches, such as baptism, confirmation, and Holy Communion. They prepare and deliver sermons and give religious instruction. They also perform marriages; conduct funerals; counsel individuals who seek guidance; visit the sick, aged, and handicapped at home and in the hospital; comfort the bereaved; and serve church members in other ways. Many Protestant ministers write articles for publication, give speeches, and engage in interfaith, community, civic, educational, and recreational activities sponsored by or related to the interests of the church. Some ministers teach in seminaries, colleges, and universities.

The services that ministers conduct differ among Protestant denominations and also among congregations within a denomination. In many denominations, ministers follow a traditional order of worship; in others, they adapt the services to the needs of youth and other groups within the congregation. Most services include Bible reading, hymn singing, prayers, and a sermon. In some denominations, Bible reading by a member of the congregation and individual testimonials may constitute a large part of the service.

Ministers serving small congregations generally work on a personal basis with their parishioners. Those serving large congregations have greater administrative responsibilities and spend considerable time working with committees, church officers, and staff, besides performing their other duites. They may share specific aspects of the ministry with one or more associates or assistants, such as a minister of education who assists in educational programs for different age groups, or a minister of music.

### Working Conditions

Ministers are "on call" for any serious troubles or emergencies that involve or affect members of their churches. They also may work long and irregular hours in administrative, educational, and community service activities.

Many of the ministers' duties are sedentary in nature, such as reading or doing research in a study or a library while preparing sermons or writing articles.

In denominations such as the Methodist Church, ministers are subject to reassignment by a central body to a new pastorate every few years.

### Employment

In 1980, an estimated 230,000 Protestant ministers served individual congregations. Some also worked in closely related fields such as chaplains in hospitals and the Armed Forces. The greatest number of clergy are affiliated with the five largest groups of churches—Baptist, United Methodist, Lutheran, Presbyterian, and Episcopal.

All cities and most towns in the United States have at least one Protestant church with a full-time minister. Some churches employ part-time ministers; many part-time clergy are seminary students, ministers retired from full-time pastoral responsibilities, or those who also have secular jobs. Although most ministers are located in urban areas, many live in less densely populated areas where they may serve two or more congregations.

### Training and Other Qualifications

Educational requirements for entry into the Protestant ministry vary greatly. Some denominations have no formal educational requirements, and others ordain persons having varying amounts and types of training in Bible colleges, Bible institutes, or liberal arts colleges.

In 1980, there were about 150 American theological institutes accredited by the Association of Theological Schools in the United States and Canada. These admit only students who have received a bachelor's degree or its equivalent with a liberal arts major from an accredited college. Many denominations require a 3-year course of professional study in one of these accredited schools or seminaries after college graduation. The degree of master of divinity is awarded upon completion.

Recommended preseminary or undergraduate college courses include English, history, philosophy, natural sciences, social sciences, fine arts, music, religion, and foreign languages. These courses provide a knowledge of modern social, cultural, and scientific institutions and problems. However, students considering theological study should contact, at the earliest possible date, the schools to which they intend to apply, to learn how to prepare for the program they expect to enter.


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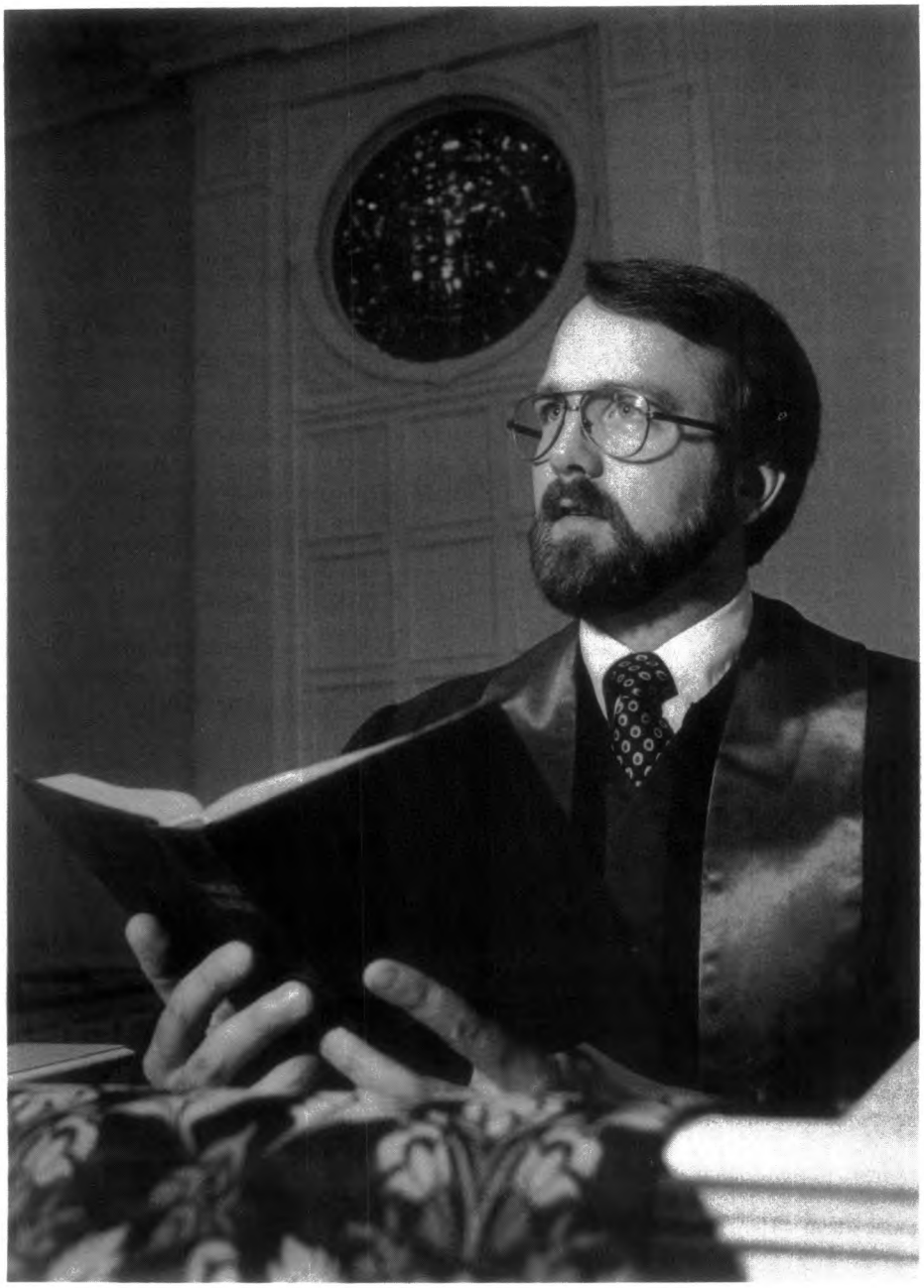

Newly ordained ministers often start out as assistant pastors.

The standard curriculum for accredited theological schools consists of four major categories: Biblical, historical, theological, and practical. Courses of a practical nature such as psychology, religious education, and administration are emphasized. Many accredited schools require that students gain experience in church work under the supervision of a faculty member or experienced minister. Some institutions offer doctor of ministry degrees to students who have completed 1 year or more of additional study after serving at least a year as minister. Scholarships and loans are available for students of theological institutions.

In general, each large denomination has its own school or schools of theology that reflect its particular doctrine, interests, and needs. However, many of these schools are open to students from other denominations. Several interdenominational schools associated with universities give both undergraduate and graduate training covering a wide range of theological points of view.

Persons who have denominational qualifications for the ministry usually are ordained after graduation from a seminary. In denominations that do not require seminary training, clergy are ordained at various appointed times. For example, the Evangelical minister may be ordained with only a high school education.

Men and women entering the clergy often begin their careers as pastors of small congregations or as assistant pastors in large churches.

## Job Outlook

The anticipated slow growth in church membership combined with pressures of rising costs and inadequate financial support are expected to result in only limited growth in requirements for ministers. However, the number of persons being ordained has been increasing and is likely to continue to do so. As a result, new graduates of theological schools are expected to face increasing competition in finding positions and more experienced ministers will face competition in their efforts to move to large congregations with greater responsibility and more remuneration. The supply-demand situation will vary among denominations, with more favorable prospects for ministers in Evangelical churches. Most of the openings for ministers that are expected through the 1980's will therefore result from the need to replace those in existing positions who leave the ministry, retire, or die.

Employment alternatives for newly ordained Protestant ministers who are unable to find positions in parishes include working in youth counseling, family relations, and welfare organizations; teaching in religious educational institutions; and serving as chaplains in the Armed Forces, hospitals, universities, and correctional institutions.

## Earnings

Salaries of Protestant clergy vary substantially, depending on age, experience, denomination, size and wealth of congregation, and geographic location. Based on limited information, the estimated median annual income of Protestant ministers was about $15,000 in 1980.

## Related Occupations

Protestant ministers advise and counsel individuals and groups regarding their religious as well as personal, social, and vocational development. Other occupations involved in this type of work include social workers, clinical and counseling psychologists, teachers, and counselors.

## Sources of Additional Information

Persons who are interested in entering the Protestant ministry should seek the counsel of a minister or church guidance worker. Each theological school can supply information on admission requirements. Prospective ministers also should contact the ordination supervision body of their particular denomination for information on special requirements for ordination.

# Rabbis

(D.O.T. 120.007-010)

## Nature of the Work

Rabbis are the spiritual leaders of their congregations, and teachers and interpreters of Jewish law and tradition. They conduct religious services and deliver sermons on the Sabbath and on Jewish holidays. Like other

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Rabbis teach and interpret Jewish law and tradition.

clergy, rabbis conduct weddings and funeral services, visit the sick, help the poor, comfort the bereaved, supervise religious education programs, engage in interfaith activities, and involve themselves in community affairs. Rabbis serving large congregations may spend considerable time in administrative duties, working with their staffs and committees. Large congregations frequently have an associate or assistant rabbi. Many assistant rabbis serve as educational directors.

Rabbis serve either Orthodox, Conservative, Reform, or Reconstructionist congregations. Regardless of their particular point of view, all Jewish congregations preserve the substance of Jewish religious worship. Congregations differ in the extent to which they follow the traditional form of worship—for example, in the wearing of head coverings, the use of Hebrew as the language of prayer, or the use of music or a choir. The format of the worship service and, therefore, the ritual that the rabbis use may vary even among congregations belonging to the same branch of Judaism.

Rabbis also may write for religious and lay publications, and teach in theological seminaries, colleges, and universities.

## Working Conditions

Rabbis work long hours and are "on call" to visit the sick, comfort the bereaved, and provide counseling to those who need it. Community and educational activities may also require long or irregular hours.

Some of their duties are intellectual and sedentary, such as studying religious texts and researching and writing sermons and articles for publication.

Rabbis have a good deal of independent authority, since there is no formal hierarchy among them. They are responsible only to the Board of Trustees of the congregations they serve.

## Employment

An estimated 3,000 rabbis served individual congregations in 1980; approximately 1,300 were Orthodox rabbis, 850 were Conservative, 750 were Reform, and 60 were Reconstructionist. Some rabbis work as chaplains in the military services, in hospitals and other institutions, or in one of the many Jewish community service agencies. Some are employed in colleges and universities as teachers in Jewish Studies programs.

Although rabbis serve Jewish communities throughout the Nation, they are concentrated in major metropolitan areas that have large Jewish populations.

## Training and Other Qualifications

To become eligible for ordination as a rabbi, a student must complete a course of study in a seminary. Entrance requirements and the curriculum depend upon the branch of Judaism with which the seminary is associated.

About 30 seminaries train Orthodox rabbis. Of these, the Rabbi Issac Elchanan Theological Seminary (an affiliate of Yeshiva University) and the Herbrew Theological College of Skokie are the two largest seminaries in the United States. Both have formal 3-year ordination programs and require a bachelor's degree for entry. Many Orthodox rabbis are ordained in seminaries with programs of varying length. There are no formal requirements for admission to these seminaries, nor are degrees, other than ordination, always granted. The training, nevertheless, is rigorous. When students have become sufficiently learned in the Talmud, the Bible, and other religious studies, they may be ordained with the approval of an authorized rabbi, acting either independently or as a representative of a rabbinical seminary.

**The Hebrew Union College—Jewish Institute of Religion is the official seminary** that trains rabbis for the Reform branch of Judaism.

The Jewish Theological Seminary of America, the official seminary that trains rabbis for the Conservative branch of Judaism, and the Hebrew Union College require the completion of a 4-year college course, as well as earlier preparation in Jewish studies, for admission to the rabbinical program leading to ordination. Normally 5 years of study are required to complete the rabbinical course at the Reform seminary, including 1 year of preparatory study in Jerusalem. Exceptionally well-prepared students can shorten this 5-year period to a minimum of 3 years. A student having a strong background in Jewish studies can complete the course at the Conservative seminary in 4 years; for other enrollees, the course may take as long as 6 years.

The Reconstructionist Rabbinical College trains rabbis in the newest branch of Judaism. A bachelor's degree is required for admission to the Reconstructionist Rabbinical College. The rabbinical program is based on a five-year course of study which emphasizes, in each year, a period in the history of Jewish civilization. In addition, students are required to earn a master's degree in a related field at an area university. Graduates are awarded the title "Rabbi" and, with special study, can earn the Doctor of Hebrew Letters degree.

In general, the curriculums of Jewish theological seminaries provide students with a comprehensive knowledge of the Bible, Talmud, Rabbinic literature, Jewish history, theology, and courses in education, pastoral psychology, and public speaking. Students of the Reform seminary get extensive practical training in dealing with social and political problems in the community. Training for alternatives to the pulpit, such as leadership in community services and religious education, increasingly is stressed.

Some seminaries grant advanced academic degrees in fields such as Biblical and Talmudic research. All Jewish theological seminar-

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ies make scholarships and loans available. Newly ordained rabbis usually begin as leaders of small congregations, assistants to experienced rabbis, directors of Hillel Foundations on college campuses, teachers in seminaries and other educational institutions, or chaplains in the Armed Forces. As a rule, the pulpits of large and well-established Jewish congregations are filled by experienced rabbis.

## Job Outlook

The job outlook for rabbis varies among the four major branches of Judaism.

Orthodox clergy currently face keen competition because the number of graduates from Orthodox seminaries is increasing at a more rapid pace than the number of pulpits.

Rabbis in the Conservative branch of Judaism, on the other hand, are expected to have good employment opportunities if present trends continue.

Reform rabbis are expected to enjoy favorable prospects for available positions because the Hebrew Union College–Jewish Institute of Religion, the only seminary that trains rabbis for the Reform branch of Judaism, has recently sought to keep supply and demand in balance by limiting enrollments.

Reconstructionist rabbis also are expected to have good employment opportunities, as supply and demand are expected to be in balance through the 1980's.

Newly ordained rabbis who do not have a pulpit may work for a Jewish social service agency, teach in a religious educational institution, or serve as chaplain in the Armed Forces or in hospitals, universities, or correctional institutions.

## Earnings

Income varies, depending on the size and financial status of the congregation, as well as its denominational branch and geographic location. Rabbis usually earn additional income from gifts or fees for officiating at ceremonies such as weddings.

Based on limited information, the annual earnings of rabbis generally ranged from $20,000 to $50,000 in 1980, including fringe benefits. Some senior rabbis in large congregations earn over $50,000 a year.

## Related Occupations

Rabbis advise and counsel individuals and groups regarding their religious as well as personal, social, and vocational development. Other occupations involved in this type of work include social workers, clinical and counseling psychologists, teachers, and counselors.

## Sources of Additional Information

Persons who are interested in becoming rabbis should discuss their plans for a vocation with a practicing rabbi. Information on the work of rabbis and allied occupations can be obtained from:

The Jewish Theological Seminary of America, 3080 Broadway, New York, N.Y. 10027. (Conservative)

The Rabbi Isaac Elchanan Theological Seminary, 2540 Amsterdam Ave., New York, N.Y. 10033. (Orthodox)

Hebrew Union College–Jewish Institute of Religion, whose three campuses are located at 1 W. 4th St., New York, N.Y. 10012; at 3101 Clifton Ave., Cincinnati, Ohio 45220; and at 3077 University Mall, Los Angeles, Calif. 90007. (Reform)

Reconstructionist Rabbinical College, 2308-10 N. Broad St., Philadelphia, Pa. 19132.

# Roman Catholic Priests

(D.O.T. 120.007-010)

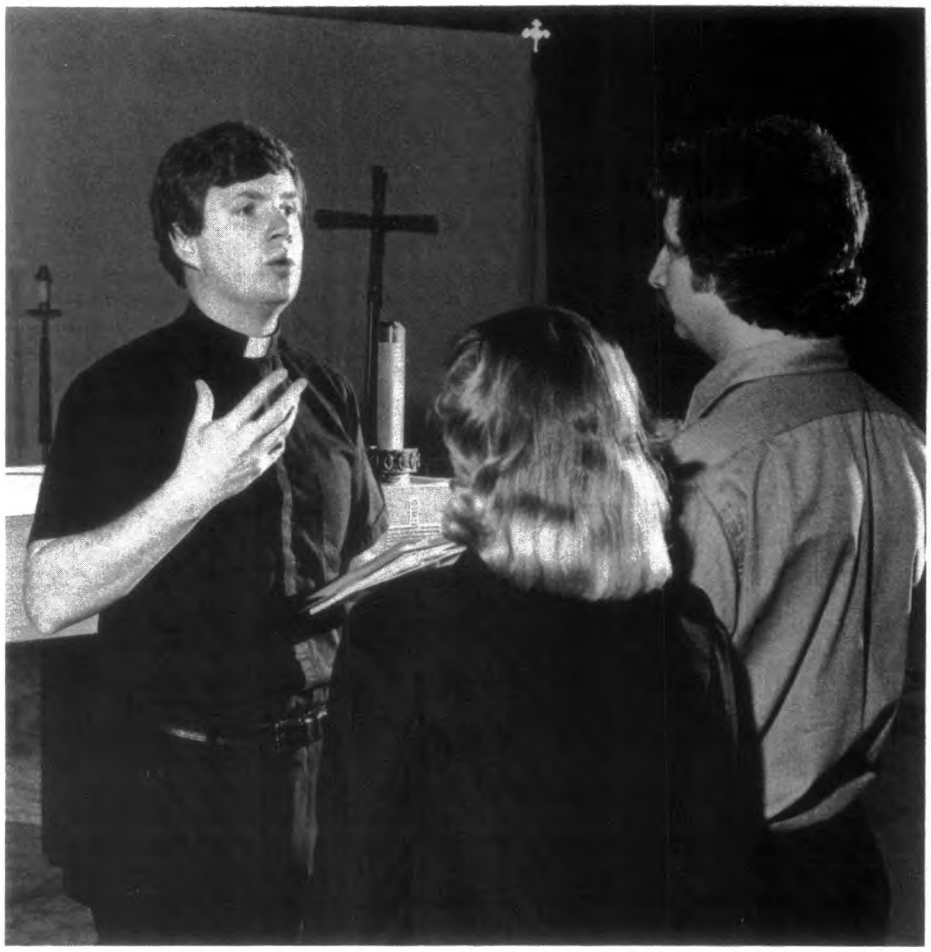
## Nature of the Work

Roman Catholic priests attend to the spiritual, pastoral, moral, and educational needs of the members of their church. Their duties involve delivering sermons; administering the sacraments of marriage and of penance, and presiding at liturgical functions, such as funeral services. They also comfort the sick, console and counsel those in need of guidance, and assist the poor.

Their day usually begins with morning meditation and Mass, and may end with the hearing of confessions or an evening visit to a hospital or a home. Many priests direct and serve on church committees, work in civic and charitable organizations, and assist in community projects.

There are two main classifications of priests—diocesan (secular) and religious. Both types have the same powers acquired through ordination by a bishop. The differences lie in their way of life, the type of work to which they are assigned, and the church authority to whom they are immediately subject. Diocesan priests generally work as individuals in parishes assigned to them by the bishop of their diocese. Religious priests generally work as part of a religious order, such as the Jesuits, Dominicans, or Franciscans. They may engage in specialized activities, such as teaching or missionary work, assigned to them by superiors of their order.

Both religious and diocesan priests hold teaching and administrative posts in Catholic seminaries, colleges and universities, and high schools. Priests attached to religious orders staff a large proportion of the church's institutions of higher education and many high schools, whereas diocesan priests are usually concerned with the parochial schools attached to parish churches and with diocesan high schools. The members of religious orders do most of the missionary work con-



Priest conducts wedding rehearsal.

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ducted by the Catholic Church in this country and abroad.

## Working Conditions

Priests spend long and irregular hours working for the church and the community.

Religious priests are assigned duties by their superiors in their particular orders. Some religious priests serve as missionaries in foreign countries where they may live under difficult and primitive conditions. Some religious priests live a communal life in monasteries where they devote themselves to prayer, study, and assigned work.

Diocesan priests ordinarily serve church members in parishes and they are "on call" at all hours to serve their parishioners in emergency situations. They also have many intellectual duties including study of the scriptures and keeping up with current religious and secular events in order to prepare sermons. Diocesan priests are responsible to the bishop in the diocese.

## Employment

There were approximately 58,000 priests in 1980, according to the National Catholic Conference. There are priests in nearly every city and town and in many rural communities. The majority are in metropolitan areas, where most Catholics reside. Large numbers of priests are located in communities near Catholic educational and other institutions.

## Training and Other Qualifications

Preparation for the priesthood generally requires 8 years of study beyond high school. There are over 450 seminaries where students receive training for the priesthood. Preparatory study may begin in the first year of high school, at the college level, or in theological seminaries after college graduation.

High school seminaries provide a college preparatory program that emphasizes English grammar, speech, literature, and social studies. Some study of Latin is required and the study of modern languages is encouraged. The seminary college offers a liberal arts program, stressing philosophy and religion; the study of man through the behavioral sciences and history; and the natural sciences and mathematics. In many college seminaries, a student may concentrate in any of these fields.

The remaining 4 years of preparation include sacred scripture; dogmatic, moral, and pastoral theology; homiletics (art of preaching); church history; liturgy (Mass); and canon law. Fieldwork experience usually is also required; in recent years, this aspect of a priest's training has been emphasized. Diocesan and religious priests attend different major seminaries, where slight variations in the training reflect the differences in the type of work expected of them as priests. Priests commit themselves not to marry.

Postgraduate work in theology is offered at a number of American Catholic universities or at ecclesiastical universities around the world, particularly in Rome. Also, many priests do graduate work in fields unrelated to theology. Priests are encouraged by the Catholic Church to continue their studies, at least informally, after ordination. In recent years, continuing education for ordained priests has stressed social sciences, such as sociology and psychology.

Young men never are denied entry into seminaries because of lack of funds. In seminaries for secular priests, scholarships or loans are available. Those in religious seminaries are financed by contributions of benefactors.

The first assignment of a newly ordained secular priest is usually that of assistant pastor or curate. Newly ordained priests of religious orders are assigned to the specialized duties for which they are trained. Depending on the talents, interests, and experience of the individual, many opportunities for greater responsibility exist within the church.

## Job Outlook

More priests will be needed in the years ahead to provide for the spiritual, educational, and social needs of the increasing number of Catholics. During the past decade, the number of ordained priests has been insufficient to fill the needs of newly established parishes and other Catholic institutions, and to replace priests who retire, die, or leave the priesthood. This situation is likely to persist and perhaps worsen, if the sharp drop in seminary enrollment continues, and if an increasing proportion of priests retire as expected.

In response to the shortage of priests, certain functions within the church traditionally performed by priests are now being performed by lay deacons, and this trend is expected to increase in the future. Priests will continue to offer Mass, administer the sacraments, and hear confession, but probably will be less involved in teaching, administrative, and community work. An increasing number of lay deacons are being ordained to preach and perform liturgical functions such as distributing holy communion and reading the gospel at the Mass.

## Earnings

Diocesan priests' salaries vary from diocese to diocese. Based on limited information, salaries range from $2,000 to $4,000 a year. The diocesan priest also may receive a car allowance of $25 to $50 a month, free room and board in the parish rectory, and fringe benefits such as group insurance and retirement benefits in the diocese.

Religious priests take a vow of poverty and are supported by their religious order.

Priests who do special work related to the church, such as teaching, usually receive a partial salary which is less than a lay person in the same position would receive. The difference between the usual salary for these jobs and the salary that the priest receives is called "contributed service." In some of these situations, housing and related expenses may be provided; in other cases, the priest must make his own arrangements. Some priests doing special work may receive the same compensation that a lay person would receive.

## Related Occupations

Roman Catholic priests advise and counsel individuals and groups regarding their religious as well as personal, social, and vocational development. Other occupations involved in this type of work include social workers, clinical and counseling psychologists, teachers, and counselors.

## Sources of Additional Information

Young men interested in entering the priesthood should seek the guidance and counsel of their parish priests. For information regarding the different religious orders and the secular priesthood, as well as a list of the seminaries which prepare students for the priesthood, contact the diocesan Directors of Vocations through the office of the local pastor or bishop.

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# Teachers, Librarians, and Counselors

Teaching, librarianship, and counseling are "people-oriented" fields that involve helping others learn, acquire information, or gain insight into themselves. Professional positions require a bachelor's degree, as a rule, although some require a master's or doctoral degree.

Teaching is one of the largest occupations in the United States. In 1980, more than 1.6 million persons taught full time or part time in kindergartens or elementary schools, and another 1.2 million taught in secondary schools. Nearly 700,000 persons were college or university faculty members. Many other teachers provided instruction in preschool programs, including nursery schools and Head Start; in adult education programs; in dance, music, and art studios; and in other places. Librarianship and counseling are much smaller fields. Approximately 145,000 librarians and audiovisual specialists and about 200,000 vocational and educational counselors were employed in 1980.

*Teaching* takes place in many different settings, and most people would agree that education is a life-long process. But perhaps our most influential educational experiences occur during the period of formal education, beginning in preschool or kindergarten and extending through early adulthood. Teachers help students gain the skills they need to function in the world around them, encouraging them to explore many subjects and master some; to identify interests and values; and to learn to make decisions. Perhaps most important, teachers help students learn to think for themselves.

*Librarianship* is undergoing profound changes as libraries try to keep up with the information explosion, assimilate new technology, and respond to budget pressures. Many libraries are restructuring services and looking for new ways to share resources, developments that may alter library staffing patterns as well.

Public libraries, long thought of as centers for recreational reading, are enlarging the scope of their activities and finding additional ways to serve the community—as information and referral services, cultural centers, and learning centers or "open universities." School libraries, also called media centers because so much of their collection is not in printed form, have become an integral part of the learning experience in elementary and secondary schools. College and university libraries provide both reference collections for students and support for highly specialized research. Special libraries and documentation centers, which generally tailor services to a single group of users, have led the field in the use of computers for information storage and retrieval. Expertise in library automation is important for all kinds of librarians, however.

*Counseling* has many dimensions. The *Handbook* covers four counseling specialties: School counseling, rehabilitation counseling, employment counseling, and college career planning and placement.

Other kinds of counselors provide personal, social, and vocational guidance in a wide range of settings, including community mental health centers, halfway houses, and counseling centers for women, minorities, veterans, ex-offenders and alcohol or drug abusers. Some employers require a master's degree in counseling, counseling psychology, social work, or a related field, but others do not. Peer counseling, which has proved highly effective in many situations, is conducted by individuals who are trained and supervised by professionals. Peer counselors do not ordinarily have professional credentials themselves, however. Moreover, counseling is a normal part of the job for many others in the "helping professions," including members of the clergy, social workers, psychologists, and nurses.

Job prospects in teaching, librarianship, and counseling are relatively poor, overall, as a result of anticipated enrollment declines in secondary schools and colleges and universities; pressures to constrain spending for public education and social services; and an abundance of qualified jobseekers. Most positions in these fields are in the public sector, where little employment growth is expected during the 1980's. Staff cutbacks in school systems and social service agencies will intensify competition for jobs.

Nonetheless, the teaching occupations in particular are so large that replacement needs alone will generate a substantial number of openings throughout the decade. Furthermore, some specializations and some parts of the country are far more promising than others. Jobseekers who have specific kinds of training and who are willing to relocate will be in a relatively favorable position. Moreover, opportunities in the private sector appear to be promising for educators with technical skills and an interest in business.

Training and human resource development, a field closely related to teaching, has attracted the attention of growing numbers of teachers seeking a career change. Trainers need many of the skills that mark successful teachers; they, too, must be able to design lesson plans, speak in front of groups, and evaluate performance. And trainers should be able to inspire interest and encourage learning. Teachers are among those who have responded to job opportunities in the growing field of employee development. However, training specialists warn that many teachers lack the knowledge of business practices and organizational dynamics needed for a successful career in private industry. For more information, see the statement on personnel and labor relations specialists elsewhere in the *Handbook*.

While library jobs are relatively hard to find, people with information-handling skills are in demand in other settings. New information-handling roles, for which many librarians are well qualified, are emerging in business and industry—in the rapidly developing "information industry" in particular.

More detailed information on job outlook and alternative careers appears in the nine statements that follow.

## College Career Planning and Placement Counselors

(D.O.T. 166.167-014 and .267-010)

### Nature of the Work

Career planning and placement counselors help bridge the gap between education and work by assisting students and alumni in all phases of career planning and job search. Helping students and alumni identify suitable fields of work is just one aspect of the job. Once a career choice has been made, the job search begins in earnest, and the counselor assists in resume writing, searching out prospective employers, and setting up job interviews.

Because a curriculum in the liberal arts is not specifically career oriented, liberal arts students in particular benefit from career planning and counseling. However, even in areas like accounting or engineering, where the connection between college major and career is quite direct, students may need help in deciding where and how to look for a job. Midlife career changers and returning students seeking to update their credentials or prepare for a new field also benefit from career counseling.

Counselors encourage students to examine their interests, abilities, values, and goals, and assist them in exploring career alternatives. They may help students test career interests by arranging internships, field placements, or part-time or summer employment. Counselors discuss the kinds of jobs open to college graduates with a particular major and help students evaluate the pros and cons of further training. To counsel students ade-

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Counselor advises college student on job search strategy.

quately, counselors must keep abreast of labor market information, including salaries, training requirements, and job prospects. This means reading career and counseling literature and maintaining contact with industry and government recruiters.

Counselors also help students find jobs. They arrange student interviews with job recruiters who visit the campus from time to time. The counselors provide employers with information about students and inform students about business operations and personnel needs in industry. They also instruct students on resume writing and interview techniques.

Some career planning and placement counselors, especially those in 2-year and community colleges, advise school administrators on curriculum and course content. They may consult employers and then suggest courses that would prepare students more adequately for local jobs. In addition, some placement directors and counselors, especially those working in small schools, also teach. All counselors maintain a library of career guidance and recruitment information.

Counselors may specialize in areas such as law, education, internships and field placements, or part-time and summer work. However, the extent of specialization usually depends upon the size and type of college as well as the size of the placement staff.

## Working Conditions

Working as they do with students, alumni, faculty, and employers, college career planning and placement counselors have people-oriented jobs. Their work entails a great deal of contact with others—in counseling sessions, meetings, public appearances, and telephone calls.

College counseling offices are busy places, and conflicting demands on the counselor's time can create considerable pressure. Career planning and placement counselors frequently work more than a 40-hour week; irregular hours and overtime often are necessary, particularly during the "recruiting season."

Many persons pursue careers as college counselors because of the intellectual stimulation and other intangible benefits of an academic environment.

## Employment

Nearly all 4-year colleges and universities and many 2-year and community colleges provide career planning and placement services to their students and alumni. Large colleges and universities may have several counselors working under a director of career planning and placement activities, and frequently have placement officers for each major branch or campus. In many schools, however, career planning and placement is the responsibility of just one person—a director—who may have some clerical assistance. And in small schools, members of the faculty or administrative staff may handle career counseling on a part-time basis.

An estimated 5,000 persons worked as college career planning and placement counselors in 1980.

## Training, Other Qualifications, and Advancement

There is no educational program that specifically prepares people for college career planning and placement work. Colleges and universities generally seek applicants with a master's degree in counseling, college student personnel work, or a behavioral science. Graduate courses for career planning and placement counseling include counseling theory and techniques, vocational testing, occupational research and information, theory of group dynamics, personnel management,organizational behavior, and industrial relations.

Some people enter the field after gaining a broad background in business, industry, government, or education. Work experience in business or industry or an internship in a career planning and placement office are helpful.

Like other counselors, college career planning and placement counselors need certain personal traits. Respect and concern for the individual are important in this field. Counselors must communicate with and gain the confidence of students, faculty, and employers to work effectively. Intellectual curiosity and openmindedness are important, for counselors need to understand the personal, economic, and environmental forces that affect career decisions. People in this field should be energetic and able to work under pressure because they must organize and administer a wide variety of activities.

Career planning and placement counselors may advance to assistant director, associate director, or director of career planning and placement; director of student personnel services; or other high-level positions in college and university administration. The statement on College Student Personnel Workers, elsewhere in the *Handbook*, describes several of these jobs. A doctoral degree is preferred, and may be required, for advancement in this field.

## Job Outlook

Little or no change in employment of career planning and placement counselors is foreseen during the 1980's, as budgetary constraints force institutions of higher education to limit student services. Although colleges and universities will continue to emphasize career planning and placement services for students at all levels, including special groups—adults seeking a midcareer change as well as minority, low-income, and handicapped students—schools are likely to use existing staff rather than hire additional personnel. Nearly all job openings will result from the need to replace counselors who transfer to other occupations or retire.

As with other academic jobs, applicants for college career planning and placement positions will face keen competition. Those with a master's degree in counseling or a related field and experience in business or industry may have the best job prospects.

## Earnings

According to a survey of colleges and universities, the median salary of student placement directors was about $20,671 in the 1980-81 academic year. Salaries generally were higher in public than in private institutions, and higher in major universities and 4-year institutions than in 2-year schools. Most counselors are employed on a 12-month basis. They are paid for holidays and vacations and usually receive the same benefits as other professional personnel employed by colleges and universities.

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## Related Occupations

College career planning and placement counselors help students to examine and evaluate their interests, abilities, and goals; explore career alternatives; and look for a job. Others who help people attain goals and solve personal problems include school counselors, employment counselors, rehabilitation counselors, personnel and labor relations specialists, social workers, psychologists, members of the clergy, teachers, and college student personnel workers.

## Sources of Additional Information

A pamphlet on college career planning and placement is available from:

The College Placement Council, Inc., P.O. Box 2263, Bethlehem, Pa. 18001.

# College and University Faculty

(D.O.T. 090.227-010)

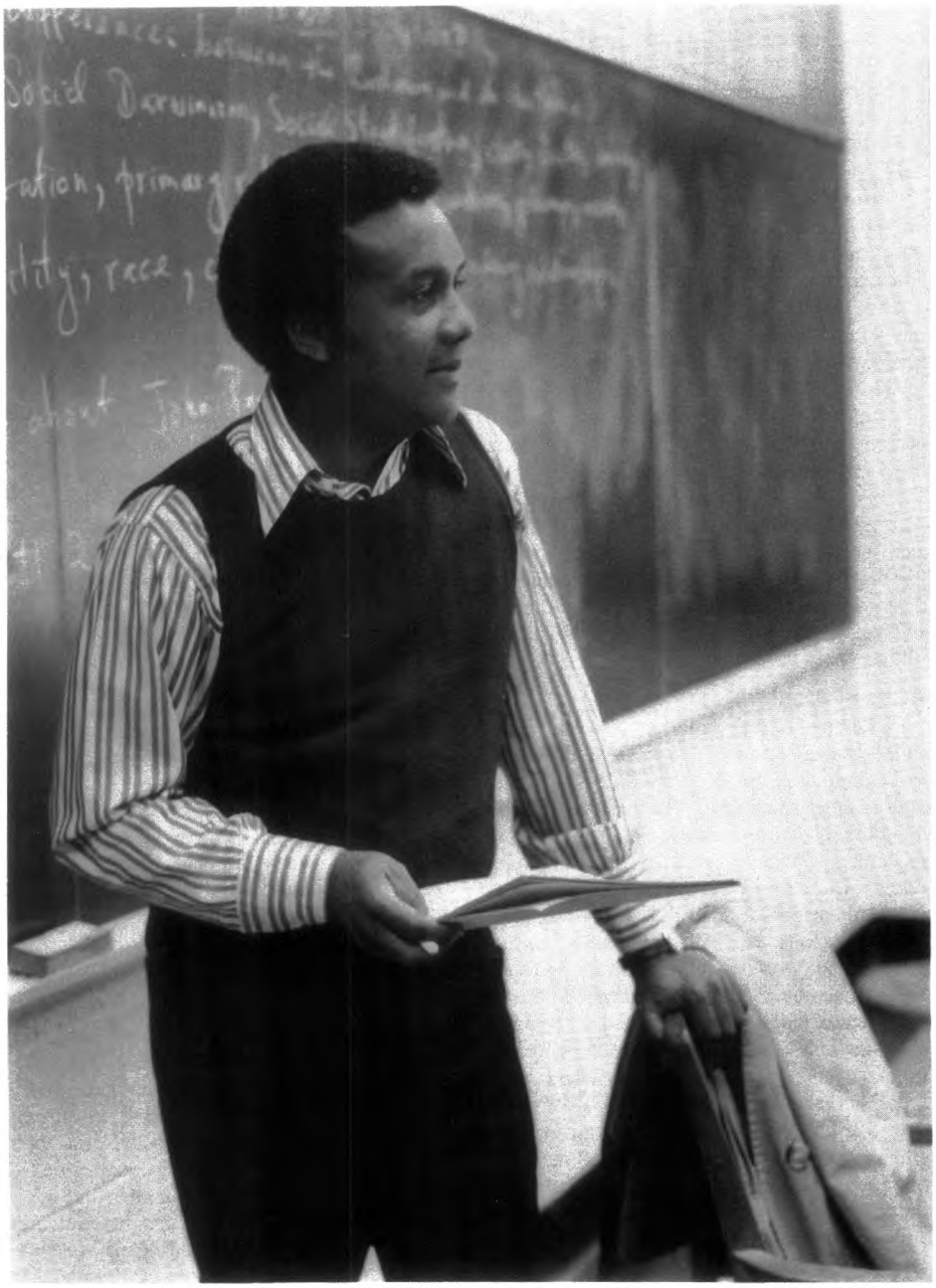
## Nature of the Work

Millions of people enroll in college every year. They enroll for personal enrichment or to obtain the skills they need for a job. While the majority are recent high school graduates, the number of older students on campus is growing. Many are homemakers who are preparing to enter or reenter the work force. Others have returned to school to obtain courses necessary for advancement in their present job or to prepare for a career change.

College and university faculty members provide instruction in particular fields of study to meet the needs of these students. Many faculty members conduct several different courses in the same field—freshman composition and 18th century English literature, for example. Many instruct undergraduates only, while some instruct both undergraduates and graduate students. Still fewer instruct only graduate students. Usually, the more experienced and educated faculty members conduct the higher level classes.

College and university faculty members use various methods to present information, depending on the subject, interest, and level of their students. Some conduct lectures in classrooms that seat hundreds of students while others lead seminars for only a few students. Still others work primarily in laboratories for subjects such as biology, engineering, or chemistry. Some have the aid of teaching assistants who may lead discussion sections or grade exams. Closed-circuit television, tape recorders, computers, and other teaching aids frequently are used.

College faculty members must keep up with developments in their field by reading current literature, participating in professional activities, and conducting scholarly research. Writing books or journal articles can be very important, and some college faculty members experience a serious conflict between their responsibilities to their students and the pressure to "publish or perish." The importance of research and publication varies, however. Research is stressed more at 4-year colleges and universities than at 2-year colleges. A recent survey indicated that over one-fourth of the faculty in science and engineering departments that offered doctoral degrees were engaged in separately budgeted research and development activities.



Job prospects for college teachers vary by academic field.

In addition to time spent on preparation, instruction, and research, college and university faculty members work with student organizations and act as student advisors, work with the college administration, and in other ways serve the institution and the community. Department heads also have supervisory and administrative duties.

## Working Conditions

College faculty members generally have flexible schedules, dividing their time among teaching, research, and administrative responsibilities. They may work odd hours, however, such as when teaching classes at night. The normal teaching load usually is heavier in 2-year and community colleges where less emphasis is placed on scholarly research and publication than in major universities.

Over 90 percent of all full-time college and university faculty work in institutions that have tenure systems (the assurance of continuing employment with freedom from dismissal without cause). Nearly three-fifths of those faculty members are tenured. Under a tenure system, a faculty member usually receives 1-year contracts during a probation-

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ary period lasting at least 3 years and ordinarily no more than 7 years; some universities award 2- or 3-year contracts. After the probationary period, institutions consider faculty members for tenure. Due to declining enrollments and budgetary constraints, however, faculty members now find it increasingly difficult to gain tenure. Colleges and universities are turning to short-term contracts and to part-time faculty to save money and avoid long-term commitments.

Few professions offer vacation arrangements as attractive as those in college teaching. In addition to the summer months during which faculty members may conduct research, prepare course and teaching materials, travel, or pursue hobbies, they also have breaks during other school holidays.

College faculty share in the growth and development of students and are constantly exposed to new ideas. Many persons pursue teaching careers because of the intangible rewards from working in an academic environment.

## Employment

According to the National Center for Education Statistics, about 691,000 faculty members taught in the Nation's 3,200 colleges and universities in 1980. An estimated 453,000 faculty members holding the rank of professor, associate professor, assistant professor, or instructor worked full time, and 209,000 worked part time. Approximately 29,000 persons were full time junior instructors. In addition to full-time and part-time faculty members, thousands of graduate students teach part time. They are employed as assistant instructors, teaching fellows, teaching assistants, or laboratory assistants.

Public institutions, which amount to less than one-half of all colleges and universities, employ over 70 percent of all full-time faculty. They employ about two-thirds of the full-time faculty in all universities and 4-year colleges, and almost 95 percent in all 2-year institutions.

Nearly one-third of full-time faculty teach in universities; almost one-half work in 4-year colleges; and over one-fifth teach in 2-year colleges.

Some part-time faculty are employed in more than one institution of higher education. Others are primarily employed outside of an academic setting—in government, private industry or in nonacademic research. These people—sometimes referred to as "adjunct faculty"—may teach as little as one course a semester.

## Training, Other Qualifications, and Advancement

The overwhelming majority of full-time college and university faculty are classified in four academic ranks: Professors, associate professors, assistant professors, and instructors. The top three ranks comprise about four-fifths of all faculty. A small proportion are classified as lecturers.

Most faculty members enter the profession as instructors and must have at least a master's degree. Because competition for positions is so keen, however, many colleges and universities consider only doctoral degree holders for entry level academic appointments.

Doctoral programs usually require 3 to 5 years of study beyond the bachelor's degree, including intensive research for a doctoral dissertation that makes an original contribution to the candidate's field of study. A working knowledge of one or more foreign languages and, in many fields, advanced mathematical and statistical techniques, often are required as well. Students should consider carefully their academic potential and motivation before beginning doctoral studies.

Advancement through the academic ranks usually requires a doctorate plus college teaching experience, even in institutions that hire master's degree holders as instructors. Assistant professors usually have a few years of prior experience as an instructor, while an appointment as associate professor frequently requires 3 years or more of experience as an assistant professor. For a professorship, extensive teaching experience and published books and articles that evidence expertise in one's discipline usually are essential.

Academic, administrative, or professional contributions affect advancement opportunities in this field. Research, publication, consulting work, and other forms of professional recognition all have a bearing on a college faculty member's chances of rising through the academic ranks.

College faculty should have inquiring, analytical minds in order to devote their lives to the pursuit and dissemination of knowledge. As teachers and researchers, they should be good at communicating, both orally and in writing. And as models for their students, they should exhibit dedication to the principles of academic integrity and intellectual honesty. College faculty must always be open to new ideas—from their students, their peers, and the nonacademic community.

## Job Outlook

The basic factor underlying the demand for college faculty is enrollment. During the 1960's and most of the 1970's, enrollments rose and employment of college faculty increased. The steady rise in the number of persons attending college reflected not only growth in the number of 18- to 21-year-olds, but an increase in the proportion of college-age persons who actually went to college. This trend is expected to change during the 1980's, as the college age population decreases.

Future college enrollment levels cannot be predicted with certainty, but it seems likely that enrollments will decline during the 1980's. Compared to the recent past, there will be many fewer people of traditional college age. A growing number of adults have entered college in recent years, many on a part-time basis, but adult enrollments are not expected to completely offset the decline in traditional-age college students. Community colleges that emphasize programs for adult learners may be an exception, in which case employment opportunities would be better in those institutions. In general, however, fewer students during the 1980's almost certainly will mean fewer college faculty members.

As a result, job openings will result almost entirely from replacement needs. In any given academic institution, the number of vacancies will be influenced by the age of current faculty, tenure patterns and policies, and retirement practices.

Competition for these openings will be extremely keen, particularly for faculty positions in the largest and most outstanding institutions. The number of Ph.D. recipients alone will exceed greatly the number of openings for college faculty through the 1980's. Many graduates who succeed in finding academic jobs may have to accept part-time or short-term appointments that offer no hope of tenure.

Some fields will offer brighter employment prospects than others, of course. Departments that report difficulty recruiting enough faculty members include engineering, computer science, business administration, and law—areas that offer very attractive jobs outside the academic setting. Employment of college faculty is related to the non-academic job market in other fields in still another way: There is an "echo effect" as favorable job prospects in a particular field—accounting, for example—cause large numbers of students to sign up for courses, thus creating a demand for more teachers. However, changes in job market conditions, especially in fields like engineering that are subject to cyclical fluctuations, may cause a field to lose its popularity with college students—and thereby reduce demand for faculty.

Preference for faculty candidates with a doctorate will continue to be much stronger in 4-year institutions than in 2-year institutions. At 2-year institutions, the lengthy research-oriented education required to earn a doctorate may not be considered advantageous.

Throughout the 1980's, an increasing proportion of prospective college faculty members will have to seek nonacademic jobs. Government and private industry will provide such positions, for the most part. However, some persons holding graduate degrees may find it necessary to enter occupations that have not traditionally required a master's degree or a Ph.D.

## Earnings

Earnings vary widely according to faculty rank and type of institution. In general, faculty members in 4-year institutions earn higher salaries, on the average, than those in 2-year schools. According to a 1980-81 survey conducted by the National Center for Education Statistics, salaries for all full-time faculty on 9-month contracts averaged around $23,267; professors, $30,738; associate professors, $23,199; assistant professors, $18,900; and instructors, $15,179.

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Many institutions pay according to salary schedules determined by rank. On the average, more faculty in public than in private institutions are covered by these schedules. In institutions without schedules, a college senate often determines salaries according to a general set of criteria.

Since over 85 percent of full-time faculty members have 9-month contracts, many have additional summer earnings from teaching, research, writing for publication, or other employment. Royalties and fees for speaking engagements may provide additional earnings. Some faculty members also undertake additional teaching or research projects or work as consultants.

Some college and university faculty members enjoy benefits offered by few other professions, including tuition waivers for dependents, housing allowances, travel allowances, and paid sabbatical leaves. In many institutions, faculty members are eligible for a sabbatical leave after 6 or 7 years of employment.

### Related Occupations

College and university faculty function both as teachers and as researchers, and they must have an aptitude for communicating information and ideas. Related occupations include: Trainers and employee development specialists, writers, consultants, lobbyists, policy analysts, social scientists, mathematicians, physical scientists, or life scientists.

### Sources of Additional Information

Professional societies generally provide information on employment opportunities in their particular fields. Names and addresses of these societies appear in the statements on specific occupations elsewhere in the *Handbook*.

Answers to specific questions pertaining to college and university teaching can be obtained from:

American Association of University Professors, One Dupont Circle, NW., Suite 500, Washington, D.C. 20036.

Extension specialists give farmers a tour of a test plot.

## Cooperative Extension Service Workers

(D.O.T. 096.121, .127, .161, and .167)

### Nature of the Work

Cooperative Extension Service workers, often called extension agents, conduct educational programs on topics such as agriculture, home economics, youth activities, and community resource development. They generally specialize in one of these areas and have titles that match their specialties, such as extension agent for youth activities or extension agent for agriculture science and horticulture. They are employed jointly by State land-grant universities and the U.S. Department of Agriculture.

Extension agents usually work with groups of people. For example, the extension agent for youth activities leads meetings of 4-H clubs, and during the summer, may organize day camps for young people. Home economics agents set up programs of interest to homemakers such as nutrition. They might suggest plans for economical meals and for buying and preparing food. Agricultural extension agents conduct meetings on topics of special interest to area farmers. In a county that has much dairy farming, extension agents arrange seminars on subjects such as dairy herd health or raising forage crops. During these seminars, agents teach farmers how to select the proper feeds to meet cows' nutritional needs and raise their output of milk, and how to establish a herd-inspection program to recognize and combat health hazards. They also may help local farmers market their products.

Extension agents for community resource development help community leaders plan for economic development and other community needs such as recreational programs and facilities, water supply and sewage systems, libraries, and schools.

In addition to group work, agents also do fieldwork with individuals. An extension or home demonstration agent may visit a farmer or homemaker to help solve individual problems.

Extension workers also provide information to the community at large about their area of specialization through a weekly newspaper column, for example, or a marketing report on local radio and television shows for agricultural products important to the area. Occasionally, extension service workers may help produce documentary films on topics in which they have special training for broadcast on local television stations. Also, extension workers at some land-grant universities produce programs for university-owned UHF and cable television stations.

In addition, State extension specialists at land-grant universities coordinate the efforts of county agents by developing ways of using the research in their fields of study at the county level. Some State extension workers also teach at the university.

### Working Conditions

Cooperative Extension Service workers do much paperwork and planning in their offices, but they also spend considerable time in the field visiting farmers, taping weekly radio shows, or attending seminars at the State university.

Extension work is not a 9 to 5 job. To discuss new farming methods and new laws that will affect farmers, extension agents often conduct evening meetings so farmers can attend.

Most extension service offices are located in small towns. As a result, extension work may be an ideal career for persons who wish to live outside the city.

### Employment

In 1980, most of the approximately 14,000 Cooperative Extension Service agents were employed by counties. Almost all of the more than 3,000 counties have county staffs. Depending on the population, staffs range in size from one agent, who serves a wide variety of interests, to a dozen or more agents, each serving a highly specialized need. Most of the remaining extension agents work for State extension services at land-grant universities. A few regional staffs serve multicounty areas, a small number work for the

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Extension Service of the U.S. Department of Agriculture and a few work in urban areas, mostly to organize 4-H activities for youth.

### Training, Other Qualifications, and Advancement

A bachelor's degree is usually required for a job as an extension service worker. Agricultural science, home economics, and training in teaching or a communications field, such as journalism, also are excellent preparation. Agricultural extension work almost requires a farm background or work experience on a farm.

Workers may receive specific instruction in extension work through pre-induction training programs or through regular in-service training programs that cover both educational techniques and their particular subject matter.

Most States require specialists and agents assigned to multicounty and State staffs to have at least one advanced degree, and, in many, they must have a Ph.D.

### Job Outlook

Employment of Cooperative Extension Service workers is expected to increase more slowly than the average for all occupations through the 1980's. Nevertheless, as agricultural technology becomes more complicated, more education and communications workers will be needed to relay information about advances in agricultural research and technology to farmers. In urban areas, more extension workers will be needed to advise officials on the design of city projects and on nutrition, recreation, and lawn and garden care.

### Earnings

According to limited data, county extension agents averaged almost $20,000 in 1980. Earnings vary, however, by State, education, experience, and area of specialization. Agricultural extension agents and community resource development specialists, for example, had the highest average annual earnings, over $21,000, while home economics agents and 4-H club agents had average annual earnings of about $18,500 and $17,500, respectively, in 1980.

### Related Occupations

Extension workers spend most of their time helping farmers and other people implement new ideas. Other occupations that involve helping people help themselves include counselors, dietitians, teachers, and social workers.

### Sources of Additional Information

Additional information is available from County Extension offices, the State Director of the Cooperative Extension Service located at each land-grant university, or the Personnel Division, U.S. Department of Agriculture, Hyattsville, Md. 20782.

## Employment Counselors

(D.O.T. 045.107-010 and -018)

### Nature of the Work

Many times, people look for jobs before they review their own assets or know enough about the labor market. Employment counselors (sometimes called vocational counselors) help people evaluate themselves and their work potential. They help clients identify their interests and abilities; make them aware of career opportunities and alternatives; help them set goals; and assist them in planning the steps they need to take to reach their goals.

Most employment counselors work in State employment offices. Others work in community agencies, supported by both public and private funds, that include career counseling centers for women; social service agencies that counsel school dropouts, drug abusers, or ex-offenders; and neighborhood organizations that help direct young people toward meaningful roles in society. Some counselors work in, or operate, private career planning and counseling firms.

To help clients gain a better understanding of their vocational interests and skills, counselors usually begin with an assessment interview. They explore education, training, work history, interests, skills, values, personal traits, physical capacities, and attitudes toward work and leisure. They may arrange for aptitude and achievement tests, and if appropriate, request physical capacities reports. Counselors may use role playing, role reversal, and similar techniques to help clients identify problem areas. After reviewing all the information they have gathered thus far, counselors help their clients identify suitable jobs. During this phase of the counseling process, they may introduce the client to various sources of career and occupational information.

Employability planning, the next phase, centers on a review of the client's employment prospects in a particular field. The counselor and client discuss occupational goals and alternatives, and determine what steps need to be taken to reach those goals. Counselors may use techniques such as confrontation to point out discrepancies between stated goals and actual behavior.

Where needs are identified, counselors refer clients to other agencies for additional services. In most instances, these referrals aim to overcome barriers to employment, such as arranging an equivalency exam for someone who has not finished high school, or suggesting a child care facility so that a parent might work. Proper referral requires that employment counselors be thoroughly familiar with other community agencies and the services they provide; that they identify and stay in touch with resource persons in other agencies; and that they know eligibility requirements and referral procedures.

Counselors may suggest specific employers and appropriate ways of applying for work. In some cases, counselors may contact employers about jobs for applicants, although placement specialists often handle this work in State employment service agencies. After job placement or entrance into training, counselors may follow up to determine if the applicant needs additional assistance.

The kinds of clients a counselor sees during a typical workday depend on the goals of the agency. In public employment offices, for example, counselors typically work with clients who have serious labor market disadvantages, such as high school dropouts, ex-offenders, or people who are emotionally unstable. Prospective clients often have trouble making a realistic job choice, or they may have problems connected with job change or job adjustment. Relatively few applicants at public employment offices are selected for counseling; those who meet the selection criteria tend to be hardest to place. Among the factors considered are resources—how much counseling time is available and how many counseling sessions a client would need—and priority. In public employment offices, the counselor is responsible for demonstrating a priority of service to special applicant groups, such as veterans, handicapped, women, and minorities.

### Working Conditions

Counselors usually work about 40 hours a week, but some in community agencies may schedule evening appointments to counsel clients already employed.

Working space is often limited, but privacy has been recognized as a critical factor in the counseling process and most offices are designed to be free from noise and distractions to allow for confidential discussions with clients.

### Employment

According to the U.S. Employment Service, almost 3,600 persons held positions as employment counselors or counseling supervisors in public employment offices in 1980. Several hundred other workers, although not classified as employment counselors, engaged in counseling activities in these offices. In addition, several thousand employment counselors worked for various private or community agencies, primarily in larger cities. Some worked in institutions such as prisons, training schools for delinquent youths, and mental hospitals.

### Training, Other Qualifications, and Advancement

All States require counselors in public employment offices to meet civil service or merit system requirements. However, State standards setting minimum education and experience vary widely. Some States require a master's degree in counseling or a related

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field; others do not. However, the majority of counselors in State employment agencies have a bachelor's degree plus additional courses in guidance and counseling. Experience in counseling, interviewing, and job placement also may be required, particularly in the case of those without advanced degrees.

Applicants with graduate degrees and additional experience may enter at higher levels on the counselor career ladder. In many States, however, individuals with extensive experience in the employment service may enter the counselor career ladder, take the prescribed university courses, and gain the necessary experience to move upward.

Entry requirements for counselors are far from uniform in private and community agencies. Most agencies prefer, and some require, a master's degree in vocational counseling or in a related field such as psychology, personnel administration, counseling, guidance education, or public administration. Many private agencies prefer to have at least one staff member who has a doctorate in counseling psychology or a related field. For those lacking an advanced degree, employers usually emphasize experience in closely related work such as rehabilitation counseling, employment interviewing, school or college counseling, teaching, social work, or psychology.

In each State, the public employment service provides an initial period of training for newly hired counselors or counselor trainees. In addition, both new and experienced counselors often enroll for training at colleges and universities during the regular academic year or at institutes or summer sessions. Private and community agencies also often provide in-service training opportunities.

Individuals interested in this field should include courses in psychology and sociology in their college program. Graduate level courses include techniques of counseling, psychological principles and psychology of careers, assessment and appraisal, cultures and environment, and occupational information. Counselor education programs at the graduate level are available in more than 400 colleges and universities, mainly in departments of education or psychology. To obtain a master's degree, students must complete 1 to 2 years of graduate study including actual supervised experience in counseling.

Persons aspiring to be employment counselors should have a strong interest in helping others make and carry out vocational decisions. They should be able to work independently and to keep detailed records.

Experienced counselors may advance to supervisory or administrative positions as directors of agencies or supervisors of guidance. Some move into research, consulting work, or college teaching. Still others go into private practice, and set up their own counseling agencies.

Counselors administer aptitude tests and interest inventories.

## Job Outlook

Qualified applicants are expected to face keen competition for jobs through the 1980's. Employment in this small occupation may be adversely affected by cuts in Federal funding for the State, local, and community agencies that provide job counseling. Because of uncertainty about future funding levels, it is difficult to project the long run outlook. However, it is likely that little employment growth will occur and most openings for employment counselors will result from the need to replace those who transfer to other fields or retire.

## Earnings

Salaries of employment counselors in State employment offices vary considerably from State to State. The average minimum salary in 1980 was about $13,900; the average maximum salary was about $18,800.

Counselors generally receive benefits such as vacations, sick leave, pension plans, and insurance coverage.

## Related Occupations

Employment counselors help people evaluate their interests, abilities, and attitudes towards work, and assist them in finding the job that best suits them. Related occupations include college career planning and placement counselors, school counselors, rehabilitation counselors, parole officers, probation officers, employment interviewers, employee compensation and benefits managers, equal employment opportunity/affirmative action managers, and training and employee development specialists.

## Sources of Additional Information

For general information on employment or vocational counseling, contact:

American Personnel and Guidance Association, Two Skyline Place, Suite 400, 5203 Leesburg Pike, Falls Church, Va. 22041.

The nearest local office of your State employment service can supply information about job opportunities and entrance requirements for positions in your State.

# Kindergarten and Elementary School Teachers

(D.O.T. 092.227-010, -014; 094.224-010, .227-010 through -022; 099.224-010)

## Nature of the Work

Kindergarten and elementary school teachers play a vital role in the development of children. What is learned or not learned in these early years can shape students' views of themselves and the world, and affect later success or failure in school.

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Kindergarten and elementary school teachers introduce children to the basics of mathematics, language, science, and social studies. They try to instill good study habits and an appreciation for learning, and observe and evaluate each child's performance and potential. Elementary school teachers look for creative ways of helping children learn, and may use films, slides, computers, or instructional games. They also arrange class trips, speakers, and class projects.

Teachers keep track of their students' social development and health. They study each child's interactions with classmates and discuss any problems with the parents. Teachers may, for example, meet with the parents of a child who habitually resists authority to discover the cause and work out a solution. Teachers also report health problems to parents and school health officials. One of the teacher's primary concerns is to insure that each child receives as much personalized help as possible.

Most elementary school teachers instruct a single group of children in several subjects. In some schools, two or more teachers team teach and are jointly responsible for a group of students or for a particular subject. An increasing number of elementary school teachers specialize in one or two subjects and teach these subjects to several classes. Some teach special subjects such as music, art, or physical education, while others concentrate on the special needs of certain groups: those with reading problems, or those who do not speak English, for example.

Much of a teacher's work occurs outside the classroom. Teachers generally prepare lessons and grade papers at home, and attend faculty meetings and supervise extracurricular activities after school. They also serve on faculty committees, such as those to revise curricula or to evaluate the school's objectives and the students' performance. To stay up-to-date on educational materials and teaching techniques, they may participate in workshops and other in-service activities and take courses at local colleges and universities.

A growing number of elementary school teachers have aides to do clerical work and to help supervise lunch and playground activities. Freed from routine duties, these teachers can give more individual attention to students.

## Working Conditions

Teachers spend much of their time standing, walking, kneeling, or even sitting on the floor. For example, kindergarten teachers may join their students on the floor to finger paint, cut out pictures, or do other crafts.

A teacher may often have to deal with disruptive, disrespectful, and sometimes even violent children, which can be physically and emotionally taxing. Giving appropriate attention to disabled pupils also adds to a teacher's load.

Most elementary school teachers work a traditional 2-semester, 10-month school year. (In most States the minimum number of days that public schools must be in session is specified by law; 180 days a year is the usual minimum.) Teachers on a 10-month schedule often are involved in the summer session or take other jobs. Many enroll in college courses or special workshops. Some teachers work in year-round schools where they work 8-week sessions, are off 1 week between sessions, and have a longer midwinter break. This 12-month schedule makes it difficult for teachers to take supplemental jobs.

Most States as well as the District of Columbia have tenure laws that protect the right to a job of teachers who have taught successfully for a certain number of years. A teacher normally must serve a probationary period of 3 years before attaining tenure status. In some States, tenure is achieved automatically when the probationary period is completed. In other States, teachers who have completed a probationary period are required to negotiate a new contract. Tenure is not an automatic guarantee of job security, but it does provide procedural protection in the event of dismissal.

## Employment

More than 1.6 million people worked as kindergarten and elementary school teachers in 1980. Most elementary school teachers work in public schools that have six grades; however, some teach in middle schools that cover the 3 or 4 years between the lower elementary grades and 4 years of high school. Fewer than 14 percent of elementary school teachers work in nonpublic schools.

A large proportion of all public elementary school teachers teach in urban areas.

## Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require public elementary school teachers to be certified by State education authorities. Some States require teachers in private and parochial schools to be certified as well. Generally, certification is granted by the State Board of Education, the State Superintendent of Education, or a Certification Advisory Committee.

Elementary school teachers may be certified to teach either the early childhood grades (nursery school through the third grade) or the elementary grades (grades 4 through 6 or 8). Some teachers obtain certification to teach special education at the elementary school level.

Requirements for certification vary by State, and school systems may have additional hiring requirements. In all States and the District of Columbia, however, prospective kindergarten or elementary school teachers must have a bachelor's degree from an institution with an approved teacher education program. Teacher training programs include a variety of liberal arts courses, as well as student teaching and prescribed education courses.

Fourteen States require that teachers pass a written examination for certification, and half the States have health, citizenship, or character requirements. Almost half of all States require teachers to have graduate degrees. This requirement is often coupled with provisions concerning continuing education. Complete information on requirements for elementary school teaching is available from any State department of education or superintendent of schools.

Information about whether a particular teacher training program is approved can be obtained from the institution or offering the training or from the State department of education. Training need not be obtained in the State in which one wants to teach. Many colleges and universities offer teacher training programs that are approved in other States. Moreover, many States have reciprocity agreements that allow teachers who have met the certification requirements in one State to become certified in another.

Kindergarten and elementary school teachers should be creative, dependable, and patient. Most important, they should want to be directly involved in the educational and emotional development of children. Competence in handling classroom situations also is important.

As a teacher gains experience, he or she may advance to supervisory, administrative, or specialized positions within the school system. Often, however, these positions require additional training and certification. As a result, for most teachers, advancement consists of higher pay rather than additional responsibility or a higher position.

## Job Outlook

Job prospects for kindergarten and elementary school teachers may improve in the late 1980's. If enrollments in teacher training institutions continue in line with past trends, supply and demand will be roughly in balance for the next few years. Beginning in the mid-1980's, there is a possibility of more openings than qualified applicants, which would mean a favorable employment outlook. Although employment is expected to grow, the major source of job openings will be the need to replace teachers who leave the profession.

Employment in kindergarten and elementary school teaching is expected to increase about as fast as the average for all occupations, primarily because of rising enrollments in the latter part of the decade. Some additional positions may be created as a result of efforts to improve the pupil-teacher ratio, while others may result from greater emphasis on special education and bilingual instruction. However, public education is under considerable taxpayer pressure to limit spending, and some communities are certain to oppose expansion of instructional staff. Indeed, in some school systems, budget problems may well force layoffs of classroom teachers.

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Enrollment levels and employment of classroom teachers are closely associated. Because of fewer births in the 1960's, elementary enrollments have been on the decline since 1967, when they peaked at nearly 32 million. While birth rates are not projected to increase substantially from the level of the mid-1970's, the number of births is expected to rise during the decade as a result of the growing number of women entering the prime childbearing ages. The National Center for Education Statistics projects that by 1983 the downward enrollment trend will halt at a level of about 26.5 million. Thereafter, elementary school enrollments will begin to climb, advancing to more than 30 million by 1990.

Enrollment growth will not occur at the same rate in all areas of the country, however. Largely because of migration to the South and West, population growth (and therefore the increase in enrollments) is expected to be greater in those regions. The U.S. Bureau of the Census projects that between 1980 and 1990, fully three-fourths of the entire increase in the number of American children ages 5 to 14 will occur in the Southern and Western States. Growth in the elementary school-age population during the 1980's is projected to be greatest in the West (11 percent) and smallest in the Northeast (1 percent).

Whether or not an elementary school teacher "shortage" will develop in the late 1980's depends only in part on the interplay of factors that affect demand for teachers. Factors affecting teacher supply will also play a role, and they are even less predictable than those affecting demand. The basic sources of teacher supply—recent graduates qualified to teach at the elementary school level and former teachers seeking reentry to the occupation—are themselves likely to respond to changes in the demand for elementary school teachers. The greater availability of jobs beginning in the mid-1980's may encourage more people to prepare for elementary school teaching and attract more people from the teacher reserve pool. If such supply responses occur, a shortage of elementary school teachers may not develop. (Training requirements for secondary school teachers are substantially different from those for elementary school teachers, and relatively few secondary school teachers are expected to undergo the additional training necessary to become certified to teach at the elementary level.)

Pupil enrollment is the basic factor underlying the need for teachers.

## Earnings

According to the National Education Association, public elementary school teachers averaged $16,879 a year in 1980-81. Generally, States in the Northeast and in the West paid the highest salaries.

Collective bargaining agreements cover an increasing number of teachers. In 1980, 31 States and the District of Columbia had laws that required collective bargaining in teacher contract negotiations, and an additional 9 States permitted such bargaining. Most public school systems that enroll 1,000 students or more bargain with teacher organizations over wages, hours, and the terms and conditions of employment.

## Related Occupations

Kindergarten and elementary school teaching requires a wide variety of skills and aptitudes, including organizational and administrative abilities, a talent for working with children, communication skills, the power to influence, motivate, and train others, creativity, and leadership ability. Other occupations that make use of some or all of these aptitudes include child care attendants; trainers and employee development specialists; employment interviewers; librarians; personnel managers; public relations representatives; social workers; and career, vocational, and school counselors.

## Sources of Additional Information

Information on certification requirements is available from local school systems and State departments of education.

Federal financial aid is available for education students preparing to work with the handicapped. For information, request *Special Education Career Preparation* from:

Closer Look, Box 1492, Washington, D.C. 20013.

Information on teachers' unions and education-related issues can be obtained from:

American Federation of Teachers, 11 Dupont Circle NW., Washington, D.C. 20036.

General information on the teaching professions can be obtained from local or State

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affiliates of the National Education Association, or by contacting:

National Education Association, 1201 16th St. NW., Washington, D.C. 20036.

A list of colleges and universities accredited by the National Council for Accreditation of Teacher Education can be obtained from:

National Council for Accreditation of Teacher Education, 1919 Pennsylvania Ave. NW., Suite 202, Washington, D.C. 20006.

# Librarians

(D.O.T. 100 except 100.367-018)

## Nature of the Work

Librarians make information available to people. They serve as a link between the public and the millions of sources of information by selecting and organizing materials and making them accessible.

Library work is divided into two basic functions: User services and technical services. Librarians in user services—for example, reference and children's librarians—work directly with users to help them find the information they need. Librarians in technical services—such as acquisitions librarians and catalogers—are primarily concerned with acquiring and preparing materials for use and deal less frequently with the information user.

The size of the collection affects the scope of the job. In small libraries or information centers, librarians generally handle all aspects of the work. They select, purchase, and process materials; publicize services; provide reference help to groups and individuals; supervise the support staff; prepare the budget; and oversee other administrative matters. In large libraries, librarians specialize in a single area, such as acquisitions, cataloging, bibliography, reference, circulation, or administration. Or they may handle special collections.

Building and maintaining a strong collection are essential in any library, large or small. *Acquisitions librarians* (D.O.T. 100.267-010) select and order books, periodicals, films, and other materials that suit users' needs. To keep abreast of current literature, they read book reviews, look over publishers' announcements and catalogs, confer with booksellers, and seek advice from library users. A knowledge of book publishing and business acumen are important, for these librarians are under pressure to get as much for their money as possible.

After materials have been received, other librarians prepare them for use. *Classifiers* (D.O.T. 100.367-014) classify materials by subject matter. They may skim through a publication quickly to be sure what it is about and then assign a classification number. *Catalogers* (D.O.T. 100.387-010) supervise assistants who prepare cards or other access tools that indicate the title, author, subject, publisher, date of publication, and location in the library. The cards are then filed in the card catalog or other appropriate storage unit.

*Bibliographers* (D.O.T. 100.367-010), who usually work in research libraries, compile lists of books, periodicals, articles, and audiovisual materials on particular subjects. They also recommend materials to be acquired in subject areas with which they are familiar. *Special collections librarians* (D.O.T. 100.267-014) collect and organize books, pamphlets, manuscripts, and other materials in a specific field, such as rare books, genealogy, or music. From time to time, they may prepare reports and exhibits to inform scholars and other researchers about important additions to the collection.

Librarians are also classified according to the type of library in which they work: Public libraries, school library/media centers, academic libraries, and special libraries.

*Public librarians* serve people of all ages and from all walks of life. Increasingly, public librarians provide materials and services to specific groups, including persons who, because of physical handicaps, cannot use conventional print materials. The professional staff of a large public library system may include the chief librarian, an assistant chief, and division heads who plan and coordinate the work of the entire system. The system also may include librarians who supervise branch libraries and specialists in acquisitions, cataloging, special collectons, and user services.

Some public librarians work with specific groups of readers. *Children's librarians* (D.O.T. 100.167-018) serve children by finding materials they will enjoy and showing them how to use the library. They may plan and conduct special programs such as story hours or film programs. In serving children, they often work with school and community organizations. *Adult services librarians* suggest materials suited to the needs and interests of adults. They may cooperate in planning and conducting education programs, such as community development, public affairs, creative arts, problems of the aging, and home and family. *Young adult librarians* (D.O.T. 100.167-034) help junior and senior high school students select and use books and other materials. They may organize programs of interest to young adults, such as book or film discussions or concerts of recorded music. They also may coordinate the library's work with school programs. *Community outreach librarians* and *bookmobile librarians* (D.O.T. 100.167-014) develop library services to meet the needs of special groups within the community. They might arrange for materials to be brought to a migrant labor camp, an inner city housing project, or a nursing home, for example.

*School librarians* (D.O.T. 100.167-030) help students learn how to use the school library/media center and show them how to find materials of special interest to them. Working with teachers and media specialists, school librarians familiarize students with the library's resources. They prepare lists of materials on certain subjects and help select materials for school programs. They also select, order, and organize materials. Increasingly, the library/media center is viewed as an integral part of the school's overall instructional program, and many school librarians work closely with classroom teachers in curriculum development. They assist teachers in developing study units and participate in team teaching.

In large high schools and in many community colleges, the media center's collection of films, tapes, cassettes, records, and other materials is maintained by a *school library media specialist* (D.O.T. 100.167-030) or an *audiovisual librarian* (D.O.T. 100.167-010). Media center professionals also develop audiovisual materials and work with teachers on curriculum.

*Academic librarians* serve students, faculty members, and researchers in colleges and universities. They work closely with members of the faculty to ensure that the general collection includes reference materials required for the hundreds of courses that might be offered during a particular academic year. They also maintain the quality of the collection in research areas for which the institution is noted.

*Special librarians* (D.O.T. 100.167-026) work in information centers or libraries maintained by government agencies and corporate firms such as pharmaceutical companies, banks, law firms, advertising agencies, medical centers, and research laboratories. They build and arrange the organization's information resources to suit the needs of their users. Often, the collection is highly specialized, being limited to subjects of particular interest to the firm. Special librarians may conduct literature searches, compile bibliographies, or prepare abstracts. In scientific and technical libraries in particular, computerized data bases are an important and much-used part of the collection. Maintaining these, and assisting users in retrieving information that has been stored in a computer's memory, are increasingly important parts of the special librarian's job.

The staff of a technical library or documentation center may also include *information scientists* (D.O.T. 109.067-010). Although they work closely with special librarians, information scientists must possess a more extensive technical and scientific background and a knowledge of various techniques for handling information. They abstract complicated information into condensed, readable form, and interpret and analyze data for a highly specialized clientele. Among other duties, they develop classification systems, prepare coding and programming techniques for computerized information storage and retrieval systems, design information networks, and develop microfilm technology.

Technological innovations are beginning to alter traditional patterns of library organization, and eventually may affect staffing as

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well. A growing number of libraries are tying into remote computer data bases through their computer terminals. The idea of serving users by providing them with access to a variety of commercial data banks took hold initially in corporate libraries and information centers. However, the practice has spread and now some public libraries, too, are linked to commercial data bases. The rise of regional library networks also has profound implications for library operations, for the networks make it less important than it once was for library to own the materials its users want. It doesn't really matter where the original material is located, if it can be accessed remotely by computer or sent by facsimile machines.

## Working Conditions

Libraries generally are busy, demanding, even stressful places to work. Contact with people, which often is a major part of the job, can be taxing. Physically, the job may require much standing, stooping, bending, and reaching.

Librarians typically work a 5-day, 35- to 40- hour week. Public and college librarians may work some weekends and evenings. School librarians generally have the same workday schedule as classroom teachers. A 35- to 40-hour week during normal business hours is common for special librarians.

## Employment

About 135,000 librarians were employed in 1980; another 10,500 individuals worked as audiovisual specialists in school library/media centers. School and academic libraries together accounted for roughly 7 out of 10 librarians. Public libraries and special libraries employed the remainder. A small number of librarians served as consultants, administered State and Federal library programs, or taught in schools of library science.

Most librarians work in cities and towns. Those attached to bookmobile units serve widely scattered population groups.

Librarians answer requests for information.

## Training, Other Qualifications, and Advancement

A master's degree in library science (M.L.S.) is necessary to obtain an entry level professional position in most public, academic, and special libraries. About 120 schools offered such degrees in 1980. However, most employers prefer graduates of one of the 70 library schools accredited by the American Library Association. Educational preparation for school librarianship is more diverse, reflecting the considerable differences among the States in standards and certification requirements for public school librarians.

Most graduate schools of library science require graduation from an accredited 4-year college or university and good grades. A broad undergraduate background, with well defined major and minor areas of study, is appropriate preparation for graduate library education. Schools' preferences as to undergraduate major vary. Some prefer students who have majored in the liberal arts or the humanities, while others seek students who have majored in science or business. In addition, some library schools require a reading knowledge of at least one foreign language. Some require introductory undergraduate courses in library science.

A typical graduate program in library science includes basic courses in the foundations of librarianship, including the history of books and printing, intellectual freedom and censorship, and the role of libraries in society. Other basic courses cover material selection and processing; reference tools; and user services. Advanced courses are offered in such areas as resources for children or young adults; classification, cataloging, indexing, and abstracting; library administration; and library automation. Because virtually all aspects of routine library operation are subject to automation, many library schools encourage students to take courses in computer and information science.

The master's of library science (M.L.S.) program represents a general, all-round preparation for library work, but some people specialize in a particular area such as archives, media, or library automation. A few M.L.S. degree holders return to library school for an additional year of study to earn a certificate of advanced study. A Ph.D. degree in library science is advantageous for a teaching position or for a top administrative post, particularly in a college or university library or in a large library system.

For those interested in special libraries or research libraries, a master's degree, doctorate, or professional degree in the appropriate

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subject specialization is highly desirable. And in academic libraries, an advanced degree may be essential for promotion to a senior level position.

State certification requirements for public school librarians vary widely. Most States require that school librarians be certified as teachers. A degree in library science may not be required, for in many schools, the library has become the "learning resources center" and is staffed by media personnel with a variety of educational backgrounds. Although some media professionals have a bachelor's or master's in library science, others have a degree in media resources, educational technology, or audiovisual communications. The State department of education can provide information about specific requirements.

Some States require certification of public librarians employed in municipal, county, or regional library systems. The State library agency can provide information about these requirements.

In the Federal Government, which currently hires about 150 librarians a year, beginning positions require completion of a 4-year college course and a master's degree in library science, or demonstration of the equivalent in experience and education by a passing grade on an examination.

Scholarships for training in library science are available from library schools, large libraries, and library associations. Loans and assistantships also are available. Under cooperative work-study programs, another form of financial aid, library schools combine the academic program with practical work experience in a library.

Because of an abundant supply of qualified jobseekers, employers in some localities now require several years' experience for what used to be entry level positions. Graduates who have participated in internship programs and work-study programs or who have worked part time may have an employment advantage over other new graduates.

Experienced librarians, primarily those who have specialized or completed graduate training in a library school, may advance to administrative positions or to specialized work. A master's degree in business or public administration may help to obtain such positions.

## Job Outlook

Employment of librarians is expected to grow more slowly than the average for all occupations through the 1980's, and most job openings will result from replacement needs.

However, the demand for individuals with library skills outside the traditional setting is expected to help ease the tight job market for librarians. Furthermore, library school enrollments, which have been declining since the mid-1970's, are expected to continue to drift downward. With fewer new graduates of M.L.S. programs entering the job market each year, the oversupply should abate, and employment prospects are expected to brighten during the 1980's.

Employment growth in public libraries is likely to be slower than it has been during the last two decades. Faced with rising materials costs and tighter operating budgets, many libraries are expected to increase their use of support staff and volunteers, and hire fewer additional librarians.

Employment of academic librarians is expected to decline slightly, a reflection of the overall decline in college enrollments expected during the 1980's. The situation will vary from institution to institution, however.

In school libraries, a large sector, little change in employment is foreseen, overall. While elementary school enrollments are projected to rise during the decade, secondary school enrollments will continue to fall. In some communities, declining enrollments and fiscal constraints are likely to result in staff cutbacks, with school librarians being transferred to classroom teaching. In other localities, however, population growth will spur demand for educational personnel, including librarians.

Opportunities should be favorable for librarians with specialized knowledge in scientific and technical fields including medicine, law, engineering, and the physical and biological sciences. These jobs are available in special libraries and research libraries, for the most part. Individuals with expertise in computerized library systems will also be in demand, because of the widespread use of computers to store information and to handle routine operations such as ordering, cataloging, and circulation control.

Information management outside the traditional library setting, a rapidly developing field, is expected to offer excellent employment opportunities for library school graduates and practicing librarians with backgrounds in information science and library automation. Private industry, consulting firms, and government agencies all need qualified people to set up and maintain information systems.

## Earnings

Salaries of librarians vary by type of library, the individual's qualifications, and the size and geographical location of the library.

Starting salaries of graduates of library school master's degree programs accredited by the American Library Association averaged $13,127 a year in 1979, and ranged from $12,218 in public libraries to $13,742 in school libraries. Starting salaries for technical librarians in private industry averaged $14,500 a year in 1980, according to an American Management Associations survey; those with more than 5 years experience averaged $21,300. The median salary for librarians in college and university libraries was $20,987 in 1980. Librarians in the Federal Government averaged about $25,500 in 1980.

The usual paid vacation after a year's service is 3 to 4 weeks. Vacations may be longer in school libraries and somewhat shorter in those operated by business and industry. Many librarians are covered by sick leave; life, health, and accident insurance; and pension plans.

## Related Occupations

Librarians play an important role in the transfer of knowledge and ideas by providing people with access to the information they need and want. Jobs requiring similar analytical, organizational, and communicative skills include archivists, information scientists, museum curators, publishers' representatives, research analysts, information brokers, book critics, and records managers.

## Sources of Additional Information

Additional information on librarianship, including a listing of accredited education programs and information on scholarships or loans, may be obtained from:

American Library Association, 50 East Huron St., Chicago, Ill. 60611.

For information on a career as a special librarian, write to:

Special Libraries Association, 235 Park Ave. South, New York, N.Y. 10003.

Material about a career in information science may be obtained from:

American Society for Information Science, 1010 16th St. NW., Washington, D.C. 20036.

Information on graduate schools of library and information science can be obtained from:

Association of American Library Schools, 471 Park Lane, State College, Pa. 16801.

Information on Federal assistance to schools for library training is available from:

Office of Libraries and Learning Technologies, U.S. Department of Education, 400 Maryland Ave. SW., Washington, D.C. 20202.

Those interested in a position as a librarian in the Federal service should write to:

Office of Personnel Management, 1900 E St. NW., Washington, D.C. 20415.

Information concerning requirements and application procedures for positions in the Library of Congress may be obtained directly from:

Personnel Office, Library of Congress, Washington, D.C. 20540.

State library agencies can furnish information on scholarships available through their offices, requirements for certification, and general information about career prospects in the State. Several of these agencies maintain job "hotlines" which report current openings for librarians in the State.

State boards of education can furnish information on certification requirements and job opportunities for school librarians.

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# Rehabilitation Counselors

(D.O.T. 045.107-042)

## Nature of the Work

Every year more and more people overcome mental, physical, or emotional handicaps and become self-sufficient and productive citizens. Some find employment in occupations previously thought too complex or physically demanding for them to handle. Others enroll in colleges and technical schools of all kinds. One member of the team of professionals that helps disabled individuals leave a sheltered environment to lead as normal a life as possible is the rehabilitation counselor.

Rehabilitation counselors start by learning about their client. Not only do they talk with him or her, they may read school reports, confer with medical personnel, and talk with family members to determine the exact nature of the disability. If the disability occurred after the person had begun his or her work life, the counselor may discuss the client's previous work experience with former employers. The counselor also confers with physicians, psychologists, and occupational therapists about the types of tasks the client can perform. At that point, the counselor begins a series of discussions with the client to explore and evaluate training and career options, and uses this information to develop a rehabilitation program.

A rehabilitation program may begin with specialized training to help make a disabled person more independent generally. When working with a blind individual, for example, the counselor may arrange for training with seeing-eye dogs. The disabled person then may spend a few months learning to cross streets and ride public transportation systems. Throughout this period, the counselor and disabled client meet regularly to discuss progress in the rehabilitation program and any problems that have arisen.

A rehabilitation program generally includes training for a specific job. Job training is one of several steps in the job placement process, and occurs only after a sufficient amount of evaluation, research, and counseling has been done to find the most suitable job for a client.

Because a client's employment success is such an important goal of rehabilitation counseling, the counselor must keep in touch with the business community to learn the types of workers needed by industry and the training required for each job. Counselors in vocational rehabilitation agencies spend some of their time publicizing the program and informing business and community leaders about the services they offer. Rehabilitation counselors in private industry keep up to date on vacancies throughout the firm that might be filled by employees who become physically or emotionally disabled.

Helping clients prepare for the job market is an important goal of rehabilitation counseling.

In addition to exploring job possibilities with disabled persons, rehabilitation counselors often make followup contacts to ensure that placement has been successful. If the new employee has a specific problem on the job, the counselor may suggest adaptations to the employer.

An increasing number of counselors specialize in a particular area of rehabilitation; some work almost exclusively with individuals who are blind, deaf, mentally ill, or retarded, or with alcoholics or drug addicts.

The amount of time spent counseling each client varies with the severity of the disabled person's problems as well as with the size of the counselor's caseload. Some rehabilitation counselors are responsible for many persons in various stages of rehabilitation; others, such as those working with the severely disabled, may work with relatively few cases at a time. Caseload size and amount of time spent with a client primarily depend on the work setting.

## Working Conditions

Rehabilitation counselors generally work a 40-hour week or less. Some evening work is required for speaking at community and civic meetings. They may spend only part of their time in their offices counseling, coordinating services, and performing necessary paperwork. The rest of their time is spent away from the office, working with prospective employers, training agencies, and the disabled person's family.

Rehabilitation counselors must maintain close contact with handicapped clients and their families over many months or even years. The counselor often has the satisfaction of watching day-by-day progress in the

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disabled person's efforts toward independence. At other times, however, the counselor may experience the disappointment of a client's failures.

## Employment

About 25,000 persons worked as rehabilitation counselors in 1980, according to the Urban Institute. About 10,000 counselors worked in State and local rehabilitation agencies financed cooperatively with Federal and State funds. Several hundred vocational rehabilitation specialists and counseling psychologists worked in the Veterans Administration's vocational rehabilitation programs, or in VA hospitals and medical centers. Rehabilitation centers, sheltered workshops, hospitals, mental health centers, special schools, centers for independent living, and other public and private agencies with rehabilitation programs and job placement services for the disabled employed thousands more. Other rehabilitation counselors worked in private industry, including insurance companies and other commercial enterprises, manufacturing firms, and rehabilitation consulting firms.

## Training, Other Qualifications, and Advancement

A master's degree in rehabilitation counseling, counseling and guidance, or counseling psychology is generally considered the minimum educational requirement for rehabilitation counselors. Vocational rehabilitation agencies in some States may, however, accept applicants with bachelor's degrees in rehabilitation services, counseling, psychology, or other related fields. Experience in employment counseling, job development, psychology, education, and social work may be helpful in securing employment as a rehabilitation counselor. Many State agencies have work-study programs whereby employed counselors can earn graduate degrees in the field.

Approximately 30 colleges and universities offer bachelor's degrees in rehabilitation services education. In some States, graduates of these programs are hired by vocational rehabilitation agencies as counselors, evaluators, and case managers. Some graduates opt to continue their professional education, and enroll in one of the graduate programs in rehabilitation counseling.

In 1980, The Council on Rehabilitation Education accredited graduate programs in rehabilitation counseling offered by about 70 colleges and universities. Usually, 2 years of study—including a period of supervised work experience—are required for the master's degree. Master's degree programs generally offer courses in human services and psychology, principles of rehabilitation counseling, counseling theory and techniques, occupational and educational information, and community resources. Also taught are courses in placement and followup, assessment and evaluation, psychosocial effects of disability, medical and legislative aspects of rehabilitation, and research methods.

The doctorate in rehabilitation counseling or in counseling psychology may take a total of 4 to 6 years of graduate study. Intensive training in psychology and other social sciences, as well as in research methods, is required.

Counselors in most State vocational rehabilitation agencies are hired in accordance with State civil service and merit system rules. In most cases, applicants must score competitively on a written examination, which sometimes is supplemented by an interview and evaluation by a board of examiners. Many private agencies and firms require rehabilitation counselors to be certified. To become certified, counselors must meet educational and work experience standards established by the Commission on Rehabilitation Counselor Certification, and pass a written examination.

Because rehabilitation counselors deal with the welfare of individuals, the ability to teach and accept responsibility is important. It also is essential that they be able to work independently and be able to motivate and guide the activity of others. Counselors who work with the severely disabled need emotional stability. They must be very patient in dealing with clients who may be discouraged, angry, or otherwise difficult to handle.

Counselors who have limited experience usually are assigned the less difficult cases. As they gain experience, their caseloads are increased and they are assigned clients with more complex rehabilitation problems. After obtaining considerable experience and more graduate education, rehabilitation counselors may advance to supervisory positions or top administrative jobs.

## Job Outlook

Employment of rehabilitation counselors is expected to grow about as fast the average for all occupations during the 1980's. Job opportunities may be best in the small but growing private sector, however.

Because most State and many private rehabilitation agencies are funded primarily by the Federal Government, employment in these organizations depends largely on the level of government spending. Reductions in Federal funding for rehabilitation services would have an adverse effect on employment in these agencies—at least until alternative funding sources could be found. While future funding levels are impossible to predict, it seems likely that during the 1980's, most job openings in State vocational rehabilitation agencies will result from replacement needs.

Substantial employment growth is expected in the private sector, particularly in insurance companies that handle worker compensation programs and in private for-profit rehabilitation consulting firms. Demand for qualified rehabilitation counselors in private industry is expected to increase as employers respond to affirmative action legislation and as they become aware of the savings that can be realized by returning disabled workers to employment. College and universities that employ coordinators of services to handicapped students are another source of employment opportunities for rehabilitation counselors.

## Earnings

The average minimum salary of rehabilitation counselors in State agencies was about $13,300 in 1980; the average maximum salary was $18,100. Vocational rehabilitation directors in these State agencies received average minimum and average maximum salaries of $32,200 and $39,100, respectively.

The Veteran's Administration paid counseling psychologists with a bachelor's degree and 60 hours of graduate credit or more starting salaries of $20,611 in early 1981. In addition, the Veteran's Administration employed a number of vocational rehabilitation specialists—generally with master's degrees—at starting salaries of $17,035 to $20,611. The average salary of vocational rehabilitation counselors in the Federal Government was $23,400 in 1980.

## Related Occupations

Rehabilitation counselors help disabled individuals become as self-sufficient as their conditions permit. Related occupations include: School counselors, employment counselors, college career planning and placement counselors, social workers, art therapists, dance therapists, music therapists, occupational therapists, physical therapists, recreational therapists, industrial psychologists, equal employment opportunity/affirmative action specialists, and training and human resource development specialists.

## Sources of Additional Information

A pamphlet entitled *Seven Careers* describes the work of rehabilitation counselors, orientation instuctors, and others. Single copies may be obtained from:

American Foundation for the Blind, 15 West 16th St. New York, N.Y. 10011.

For information about rehabilitation counseling as a career, contact:

American Rehabilitation Counseling Association, Two Skyline Place, 5203 Leesburg Pike, Suite 400, Falls Church, Va. 22041.

National Rehabilitation Counseling Association, Cary Building, Suite B-110, 8136 Old Keene Mill Rd., Springfield, Va. 22152.

National Council on Rehabilitation Education, 2210 Massachusetts Ave, NW., Washington, D.C. 20008.

American Psychological Association, 1200 17th St. NW., Washington, D.C. 20036.

A list of Federally-funded programs offering training in rehabilitation counseling may be obtained from:

Division of Manpower Development, Rehabilitation Services Administration, U.S. Department of Education, Washington, D.C. 20201.

Information on certification requirements and procedures is available from:

Commission on Rehabilitation Counselor Certification, 162 North State St., Chicago, Ill. 60601.

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A list of accredited graduate programs in rehabilitation counseling may be obtained from:

Council on Rehabilitation Education, 162 North State St., Chicago, Ill. 60601.

# School Counselors

(D.O.T. 045.107-010)

## Nature of the Work

Uncertainty about a career choice, difficulty with a particular class, or an unhappy home life are examples of problems that students face. Problems cannot always be solved by the student alone; professional assistance may be needed. Most school systems employ counselors to give individual attention to students' educational, career, and personal development.

The counselor's primary role is to help students understand themselves better—their abilities, interests, talents, personality characteristics, and career options. To accomplish this, counselors often administer tests and conduct individual or group counseling sessions in which they evaluate or explain the results. In some cases they refer students to other specialists within the school system or in the community.

School counselors devote their time to the social, behavioral, personal, and career planning concerns of youth. In addition to counseling the students themselves, they consult with parents and with other members of the school staff, such as teachers, school psychologists, school nurses, and school social workers. Often, teachers and counselors confer about problems affecting a student or group of students. A teacher may refer a student who appears to have problems dealing with classmates to a counselor who will attempt to find the cause. Counselors may arrange meetings with parents or community organizations, such as mental health agencies, if a student's problems are serious. The counselor also acts as a spokesperson for the individual student who is having difficulty communicating his or her problems to parents or teachers. When necessary, the counselor may attempt to change those aspects of the school environment that are harmful to the psychological well-being of the student.

Counselors deal with problems affecting the school as a whole as well as those affecting only one or two individuals. If drug abuse is a problem, counselors may initiate group counseling sessions to discuss the dangers of taking drugs. Or they may speak individually with students and their parents.

School counselors may also provide educational, vocational, or career guidance assistance. They might run a career information center, for example, or a career education program, which helps students explore career alternatives. A counselor might suggest ways in which teachers could incorporate career information into their classes, arrange field trips to factories and businesses, or show films that depict actual work settings.

School counselors must stay up-to-date about opportunities for education and training beyond high school in order to counsel students about admission requirements, entrance exams, sources of student financial aid, and the relative merits of military service, apprenticeship, job training in a trade school or technical institute, or a college education.

High school counselors often help students find part-time and summer jobs and assist them in getting their working papers if they need them. Counselors may help with job placements for students in work-study programs, and advise both graduates and dropouts on employment opportunities in the community.

Elementary school counselors help children to make the best use of their abilities by identifying these and other basic aspects of the child's makeup at an early age, and by evaluating any learning strengths or problems. Methods used in counseling grade school children differ in many ways from those used with older students. Observations of classroom and play activity furnish clues about children in the lower grades. To understand children better, elementary school counselors devote much of their time to consulting with parents and teachers. In some elementary schools, counselors organize career education activities designed to introduce children to the world of work.

Some school counselors, particularly in secondary schools, teach units on occupational information within social studies or other courses. They also may supervise school clubs or other extracurricular activities related to the exploration of career and educational options.

## Working Conditions

Most school counselors work the traditional 10-month school year with a 2-month vacation, although an increasing number are employed on 10-1/2 or 11 month contracts. Counselors work closely with school administrators, teachers, and parents as well as students. Helping students solve specific problems can be emotionally exhausting, as well as rewarding.

## Employment

An estimated 53,000 people worked as public school counselors during 1980; several thousand others worked in private schools. Although school counselors work in both elementary and secondary schools, the majority are in secondary schools. Most counselors work in large schools. Those employed in small school districts may be assigned to several schools.

## Training, Other Qualifications, and Advancement

Most States require public school counselors to have counseling and teaching certificates. However, requirements are changing, and a growing number of States no longer require that counselors have a teaching certificate. Depending on the State, a master's degree in counseling, from 1 to 5 years of teaching experience, and some non-education work experience may be required for a counseling certificate. People who plan to become school counselors should learn the requirements of the State in which they plan to work since requirements vary among States and change rapidly.

College students interested in becoming school counselors usually take the regular program of teacher education, with additional courses in psychology and sociology. In

Counselor discusses course selection with high school student.

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States where teaching experience is not a requirement, it is possible to major in a liberal arts program. A few States substitute a counseling internship for teaching experience. In some States, teachers who have completed part of the courses required for the master's degree in counseling are eligible for provisional certification and may work as counselors under master counselor supervision while they take additional courses.

Counselor education programs at the graduate level are available in over 450 colleges and universities, usually in the departments of education or psychology. Two years of graduate study usually are necessary for a master's degree. Most programs provide supervised field experience.

Subject areas of required graduate level courses usually include appraisal of the individual student, individual counseling procedures and techniques, group guidance, information services for career development, professional relations and ethics, statistics, and research methods.

The ability to help young people accept responsibility for their own lives is important for school counselors. They must be able to inspire respect, trust, and confidence. They should be able to coordinate the activities of others and work as part of the team which forms the educational system.

School counselors may advance by moving to a larger school; becoming director or supervisor of counseling or guidance; or, with further graduate education, becoming a college counselor, educational psychologist, vocational psychologist, school psychologist, or school administrator. Usually educational or vocational psychologists must have the Ph.D. degree.

## Job Outlook

Little change in employment of school counselors is expected through the 1980's, and most job openings will result from replacement needs.

Pupil enrollment, the major factor affecting employment of school counselors, is expected to decline at the secondary level but increase at the elementary level over the next decade. Because fewer counselors are used in elementary schools, however, little if any employment growth is expected overall. Indeed, in some places, severe budget constraints will mean fewer counseling positions. Counselors whose positions are cut as a results of declining enrollments or fiscal constraints may be able to transfer to classroom teaching in States where counselors must also hold teacher certification.

## Earnings

According to a recent survey, the average salary of school counselors in the academic year 1980-81 was around $20,600. Salaries varied by size, grade level, and locality of the school. Average salaries ranged from around $14,200 in the Southeast to about $26,500 in the West. School counselors usually earn more than classroom teachers.

In most school systems, counselors receive regular salary increments as they obtain additional education and experience. A small number of counselors supplement their income by part-time consulting or other work with private or public counseling centers, government agencies, or private industry.

## Related Occupations

School counselors help students gain a better understanding of their interests, abilities, and personality characteristics, and also help them deal with personal, social, academic, and vocational problems. Others who help people in similar ways include college career planning and placement counselors, clinical psychologists, teachers, parole officers, probation officers, school social workers, school psychologists, employment counselors, and vocational rehabilitation counselors.

## Sources of Additional Information

Career information is available from:

American Personnel and Guidance Association, Two Skyline Place, Suite 400, 5203 Leesburg Pike, Falls Church, Va. 22041.

State departments of education can supply information on colleges and universities that offer training in guidance and counseling as well as on the State certification requirements.

# Secondary School Teachers

(D.O.T. 091.221-010, .227-010; 094.224-010, .227-010 through -022; 099.224-010, .227-022)

## Nature of the Work

The high school years are the years of transition from childhood to young adulthood. They are the years when students delve more deeply into subject matter introduced in elementary school and learn more about themselves and the world. They are also a time of preparation for adult roles. Secondary school teachers facilitate this process.

The primary function of the secondary school teacher is to instruct students in a specific subject, such as English, foreign languages, mathematics, social studies, or science. Within a teacher's specialized subject area, he or she may teach a variety of courses. A social studies teacher, for example, may instruct two 9th grade classes in American History, two 12th grade classes in Contemporary American Problems, and another class in World Geography. For each class, the teacher develops lesson plans, prepares and gives examinations, and arranges class projects and other activities.

Teachers design their classroom presentations to meet the individual needs and abilities of their students. They may arrange tutoring for students or give advanced assignments for highly motivated pupils. Recognizing the needs of each student can be difficult because most teachers conduct five separate classes a day, each of which may have 10 to 30 students.

Teachers use a variety of instructional materials including films, slides, and computer terminals. They also may arrange for speakers or trips to supplement the classroom work.

Some teachers give vocational education courses, such as welding, auto mechanics, or cosmetology, that train students for jobs after graduation. These teachers instruct with the actual tools of the trade, whether they be 4-cylinder car engines or hairdryers.

In addition to their regular classes, secondary school teachers supervise study halls and homerooms, advise student groups, and attend meetings with parents and school personnel. Teachers also participate in workshops and college classes to keep up-to-date on their subject specialty and on current trends in education.

## Working Conditions

In addition to hours spent with their classes, teachers spend time preparing lessons, grading papers, making reports, attending meetings, and supervising extracurricular activities. As a result, most teachers work well over 40 hours a week.

Teaching involves long periods of standing and talking and can be both physically and mentally tiring. Dealing with disruptive students can also be emotionally exhausting.

While many teachers work the traditional 10-month school year with a 2-month vacation, some school districts have converted to a year-round schedule. Teachers on this type of schedule may work 8 weeks, be on vacation for 1 week, and have a 5-week midwinter break. In most States the minimum number of days that a school must be in session is specified by law; the usual minimum number of instruction days is 180 days.

The District of Columbia and most States have tenure laws that protect the right to a job of teachers who have taught successfully for a certain number of years. A teacher normally must serve a probationary period of 3 years before attaining tenure status. In many States, tenure is automatic if the probationary period is completed and the teacher's contract has not been terminated. In other States, teachers who have completed a probationary period are required to negotiate a new contract. Tenure is not an automatic guarantee of job security, but it does provide procedural protection in the event of dismissal.

## Employment

About 1.2 million secondary school teachers were employed in 1980. More than 90 percent taught in public schools. Although they work in all parts of the country, teachers are concentrated in cities and surburan areas.

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## Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require public secondary school teachers to be certified. Many States require teachers in private and parochial schools to be certified as well. Usually certification is granted by the State Board of Education, the State Superintendent of Education, or a Certification Advisory Committee.

Requirements for certification to teach at the secondary school level vary by State, and school systems may have additional requirements. However, in all States and the District of Columbia, prospective teachers need a bachelor's degree from an approved teacher training program with a prescribed number of credits in the subject they plan to teach. They must have completed student teaching and other education courses.

Fourteen States require that teachers pass a written examination for certification, and some States have health, citizenship, or character requirements. Almost half the States require teachers to have graduate degrees. This requirement is often coupled with provisions concerning continuing education. (Over half of all States require continuing education for certification.) Prospective teachers may obtain information on certification requirements for secondary school teaching from any State department of education or superintendent of schools.

Information about whether a particular teacher training program is approved can be obtained from the institution offering the training from the State department of education. Training need not be obtained in the State in which one wants to teach. Many colleges and universities offer teacher training that is approved in other States. Moreover, many States have reciprocity agreements that allow teachers who have met the certification requirements in one State to become certified in another.

Secondary school teachers should be good at working with young people, interested in a special subject, and able to motivate students and to relate knowledge to them.

With additional preparation, and another certificate as well, experienced teachers may be able to move into positions as school librarians, reading specialists, curriculum specialists, or guidance counselors. However, for most secondary school teachers, advancement takes the form of a higher salary rather than a different job. Relatively few teachers move into administrative or supervisory positions in a public school system. To do so usually requires at least 1 year of graduate education and several years of classroom teaching, and sometimes a special certificate as well.

## Job Outlook

Prospective secondary school teachers will face keen competition for jobs throughout the 1980's. If past trends continue, the supply of persons qualified to teach will greatly exceed requirements, and an increasing proportion of qualified graduates will have to consider alternatives to secondary school teaching. College students interested in becoming secondary school teachers would be well-advised to take courses that are applicable to jobs outside the teaching field. A willingness to relocate may be an advantage in obtaining a teaching job.

The prime sources of teacher supply are recent college graduates qualified to teach secondary school and former teachers seeking to reenter the profession. Although reentrants have experience in their favor, many schools may prefer to hire new graduates who command lower salaries and whose training is more recent.

Employment of secondary school teachers is expected to decline throughout the 1980's and, as a result, nearly all openings will stem from the need to replace teachers who retire or leave the profession. Pupil enrollment is the basic factor underlying the demand for teachers. Because of fewer births starting in the early 1960's, secondary school enrollments began declining in the mid-1970's. The National Center for Education Statistics projects that enrollment in secondary schools will continue to decline during the 1980's, thereby reducing the demand for teachers.

The decline in enrollment will be more severe in some parts of the country than in others if past trends in migration prevail through the 1980's. Demand for secondary school teachers could fall precipitously in the Northeast and North Central States, where the U.S. Bureau of the Census projects a decline of close to 25 percent in the number of 15-19 year olds between 1980 and 1990. Although the number of youngsters of secondary school age is projected to decline in the South and West as well, the decrease is expected to be somewhat less, roughly 15 percent.

Employment of teachers is also sensitive to changes in State and local expenditures for education. Pressure from taxpayers to limit tax and spending increases are likely to continue through the 1980's, but budget pressures on public education are far greater in some States and localities than in others. Moreover, school systems respond to budget constraints in different ways. Increased emphasis on special student needs may lead some school systems to hire teachers to provide special or bilingual education. But budget pressures in other districts will undoubtedly result in the loss of classroom teaching positions.

Although the overall outlook for secondary teachers indicates a highly competitive market, employment conditions are favorable in certain fields. Persons qualified to teach mathematics, natural sciences, and physical sciences are currently in great demand. Shortages in these fields may well continue, chiefly because of salary competition from business and industry. Some schools report difficulty in finding enough teachers qualified in special education and bilingual education.

Teaching often continues after the class ends.

## Earnings

According to the National Education Association, public secondary school teachers averaged $17,725 a year in 1980-81. Generally, salaries were highest in States in the Northeast and in the West.

Collective bargaining agreements cover an increasing number of teachers. In 1980, 31 States and the District of Columbia had enacted laws that required collective bargaining in teacher contract negotiations, and an additional 9 States permitted such bargaining.

In some schools, teachers receive supplementary pay for coaching sports and working with students in extracurricular activities, such as music, drama, or school publications. Some teachers work in the school system during summer sessions. Others hold summer jobs outside the school system.

## Related Occupations

Secondary school teaching requires a wide variety of skills and aptitudes, including organizational and administrative talents; research abilities; communication skills; the power to influence, motivate, and train others; record-keeping expertise; creativity; helpfulness; and leadership ability. Other occupations which make use of some or all of these aptitudes include: School administrators; career, vocational, or school counselors; trainers and employee development specialists; employment interviewers; encyclopedia research workers; librarians; personnel managers; public rela-

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tions representatives; records managers; sales representatives; and social workers.

## Sources of Additional Information

Information on certification requirements and approved teacher training institutions is available from State departments of education.

Federal financial aid is available for education students preparing to work with the handicapped. For information, request *Special Education Career Preparation* from:

Closer Look, Box 1492, Washington, D.C. 20013.

Information on teacher unions and education-related issues may be obtained from:

American Federation of Teachers, 11 Dupont Circle NW., Washington, D.C. 20036.

General information on the teaching professions can be obtained from local or State affiliates of the National Education Association, or by contacting:

National Education Association, 1201 16th St. NW., Washington, D.C. 20036.

A list of colleges and universities accredited by the National Council for Accreditation of Teacher Education can be obtained from:

National Council for Accreditation of Teacher Education, 1919 Pennsylvania Ave. NW., Suite 202, Washington, D.C. 20006.

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# Health Diagnosing and Treating Practitioners

The health professionals whose work is described in the following statements diagnose, treat, and strive to prevent illness and disease. Largest of these occupations is *physicians*, numbering 405,000 persons in 1980, followed by *dentists*, who numbered 126,000. The other practitioner occupations described in this section of the *Handbook* are much smaller, ranging in size from *veterinarians* (36,000) to *podiatrists* (12,000).

All of them practice the art of healing, but they differ in the methods of treatment they use and in their areas of specialization. Physicians prescribe medications, exercise, proper diet, and surgery for their patients. *Osteopathic physicians* use these treatments and, in addition, manipulate muscles and bones, especially the spine. These manipulations are the primary form of treatment given by *chiropractors*. *Optometrists* specialize in eye care and *podiatrists* treat foot diseases and deformities. *Dentists* emphasize not only the treatment but the prevention of problems associated with the teeth and gums. *Veterinarians* treat animals and inspect meat, poultry, and other food as part of public health programs.

Because these practitioners routinely make independent decisions affecting the health and well-being of the public, they are closely regulated. States require that health practitioners be licensed and pass a State board examination. Only physicians, osteopaths, podiatrists, dentists, and veterinarians can use drugs and surgery in their treatment.

Among these seven health practitioner occupations, requirements for a license vary from 6 to 9 years of postsecondary education. After graduation from college, osteopaths must complete a 4-year program and physicians generally a 3- or 4-year program. Most States require a 1-year residency for both physicians and osteopaths. Physicians who specialize must spend additional years in training and pass a specialty board examination. Two years of college are required for entry to the 4-year chiropractic schools. Optometrists, podiatrists, and veterinarians all must complete a minimum of 2 years of college before beginning the 4-year program.

Although the employment outlook in most of these occupations is expected to be favorable during the 1980's, the job market is clearly changing as the supply of newly trained practitioners begins to overtake demand. The physician shortage that existed during the 1950's and 1960's has passed. Indeed, a few cities are oversupplied with physicians. Nonetheless, the population is growing, especially the number of older people who are relatively heavy users of health services, and many geographic areas need additional health care practitioners. So the outlook for most practitioners will be favorable. Veterinary medicine is becoming increasingly crowded, however. Veterinary school graduates are experiencing some difficulty finding positions with established practitioners, and competition is likely to intensify through the 1980's. For more detailed information about employment outlook, see the individual statements that follow.

Training to become a health practitioner is much more rigorous than that for most other professional occupations, but practice also offers unusual rewards. Incomes of health practitioners greatly exceed the average and generally are higher than those of other professional workers with similar years of graduate education. Furthermore, health practitioners enjoy great prestige within the community, and most derive considerable satisfaction from knowing that their work contributes directly to the well-being of others.

All health practitioners must have the ability and perseverance to complete the years of study acquired. They should be emotionally stable, able to make decisions in emergencies, and have a strong desire to help the sick and injured. Sincerity and an ability to gain the confidence of patients also are important qualities.

Books and brochures on health careers are widely available—look for them in libraries, counseling centers, and bookstores. The Sources of Additional Information section at the end of each *Handbook* statement identifies organizations that can provide career pamphlets, lists of accredited schools, and sources of financial aid. For an overview of jobs in the health field, including some jobs not covered in the *Handbook*, request a copy of "200 Ways to a Health Career" from:

National Health Council, 1740 Broadway, New York, N.Y. 10019.

Another useful publication is the *Health Careers Guidebook*, fourth edition, published in 1979 by the U.S. Department of Labor and the U.S. Department of Health, Education and Welfare (now the Department of Health and Human Services.) It is available for $6. from:

Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

## Chiropractors

(D.O.T. 079.101-010)

### Nature of the Work

Chiropractic is a system of treatment based on the principle that a person's health is determined largely by the nervous system, and that interference with this system impairs normal functions and lowers resistance to disease. Chiropractors treat patients primarily by manual manipulation (adjustments) of parts of the body, especially the spinal column.

Because of the emphasis on the spine and its position, most chiropractors use X-rays to help locate the source of patients' difficulties. In addition to manipulation, chiropractors use water, light, massage, ultrasound, electric, and heat therapy. They also prescribe diet, supports, exercise, and rest. Most State laws specify the types of supplementary treatment permitted in chiropractic. Chiropractors do not use prescription drugs or surgery.

### Working Conditions

Almost all chiropractors work in private offices that are clean and comfortable. The typical workweek is 4 1/2 to 5 days. Because most chiropractors are self-employed, they can practice well beyond normal retirement age.

### Employment

About 23,000 persons practiced chiropractic in 1980. Most were in private practice and about three-fourths were in solo practice—that is, they had no partners. Some were salaried assistants of established practitioners or worked for chiropractic clinics. A small number taught or conducted research at chiropractic colleges.

Chiropractors often locate in small communities—about half work in cities of 50,000 inhabitants or less.

### Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia regulate the practice of chiropractic and grant licenses to chiropractors who meet certain educational requirements and pass a State board examination. Many States have reciprocity agreements that permit chiropractors already licensed in another State to obtain a license without taking an examination.

The type of practice permitted and the educational requirements for a license vary considerably from one State to another. For example, 36 State boards recognize only academic training in chiropractic colleges accredited by the Council on Chiropractic Education. In general, State licensing boards require successful completion of a 4-year chiropractic course following 2 years of col-

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Chiropractors treat patients primarily by manual manipulation.

lege. Some States require specific college courses such as English, chemistry, biology, or physics. Several States require that chiropractors pass a basic science examination. The National Board of Chiropractic Examiners' test given to fourth-year chiropractic students is accepted by 40 State boards in place of a State examination.

In 1980, 7 of the 17 chiropractic colleges in the United States were fully accredited by the Council on Chiropractic Education; 4 others were recognized candidates working toward accreditation. All chiropractic colleges require applicants to have a minimum of 2 years of undergraduate study, including courses in English, the social sciences, chemistry, biology, and mathematics.

Chiropractic colleges emphasize courses in manipulation and spinal adjustments. Most offer a broader curriculum, however, including subjects such as physiotherapy and nutrition. In most chiropractic colleges, the emphasis during the first 2 years is on classroom and laboratory work in subjects such as anatomy, physiology, and biochemistry, while the last 2 years stress clinical experience. Students completing chiropractic training earn the degree of Doctor of Chiropractic (D.C.).

Chiropractic requires a keen sense of observation to detect physical abnormalities and considerable hand dexterity but not unusual strength or endurance. Persons desiring to become chiropractors should be able to work independently and handle responsibility. The ability to work with detail is important. Sympathy and understanding are desirable qualities for dealing effectively with patients.

Most newly licensed chiropractors either set up a new practice or purchase an established one. Because of the financial investment necessary to open and equip an office, many start as salaried chiropractors to acquire the experience and the funds needed.

### Job Outlook

Employment of chiropractors is expected to grow about as fast as the average for all occupations through the 1980's. Demand for chiropractic is related closely to public acceptance of the profession, which appears to be growing, and to the ability of patients to pay for services, either directly or through broader coverage of chiropractic services by public or private health insurance. Enrollments in chiropractic colleges have grown dramatically, however, and as more students graduate, new chiropractors may find it increasingly difficult to establish a practice in those areas where other practitioners already are located.

### Earnings

In chiropractic, as in other types of independent practice, earnings are relatively low in the beginning. New graduates who worked as associates to established practitioners earned more than $15,000 a year in 1980. Experienced chiropractors averaged about $44,000, after expenses, according to a survey conducted by the American Chiropractic Association.

### Related Occupations

Chiropractors diagnose, treat, and work to prevent diseases, disorders, and injuries. They emphasize the importance of the nervous system for good health. Others whose professions require similar skills include acupuncturists, audiologists, dentists, naturopathic doctors, optometrists, osteopaths, podiatrists, speech pathologists, and veterinarians.

### Sources of Additional Information

The board of licensing in each State capital can supply information on State licensing requirements for chiropractors.

General information on chiropractic as a career is available from:

American Chiropractic Association, 2200 Grand Ave., Des Moines, Iowa 50312.

International Chiropractors Association, 1901 L St. NW., Suite 800, Washington, D.C. 20036.

For a list of chiropractic colleges, as well as general information on chiropractic as a career, contact:

Council on Chiropractic Education, 3209 Ingersoll Ave., Des Moines, Iowa 50312.

For information on requirements for admission to a specific chiropractic college, contact the admissions office.

## Dentists

(D.O.T. 072)

### Nature of the Work

Dentists examine teeth and tissues of the

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mouth to diagnose diseases or abnormalities. They take X-rays, fill cavities, straighten teeth, and treat gum diseases. Dentists extract teeth and substitute artificial dentures designed for the individual patient. They also perform corrective surgery of the gums and supporting bones. In addition, they may clean teeth and provide other preventive services.

Dentists spend most of their time with patients, but may devote some time to laboratory work such as making dentures and inlays. Most dentists, however—particularly those in large cities—send their laboratory work to commercial firms. Some dentists employ dental hygienists to clean patients' teeth and provide instruction for patient self-care. Dentists may also employ other assistants to perform office work, assist in "chairside" duties, and provide therapeutic services under their supervision. (The work of dental hygienists and dental assistants is described elsewhere in the *Handbook*.)

Most dentists are general practitioners who provide many types of dental care; about 10 percent are specialists. The largest group of specialists are orthodontists, who straighten teeth. The next largest group, oral surgeons, operate on the mouth and jaws. The remainder specialize in pedodontics (dentistry for children); periodontics (treating the gums); prosthodontics (making artificial teeth or dentures); endodontics (root canal therapy); public health dentistry; and oral pathology (diseases of the mouth).

About 5 percent of all dentists teach in dental schools, do research, or administer dental health programs on a full-time basis. Many dentists in private practice do this work on a part-time basis.

Filling a tooth requires manual dexterity.

## Working Conditions

Most dental offices are open 5 days a week, and some dentists have evening hours. Dentists usually work between 40 and 45 hours a week, although many spend more than 50 hours a week in the office. Dentists often work fewer hours as they grow older, and a considerable number continue in part-time practice well beyond the usual retirement age.

## Employment

According to the U.S. Public Health Service, about 126,000 individuals practiced dentistry in the United States in 1980. Nine out of 10 were in private practice. About 5,000 served as commissioned officers in the Armed Forces, and another 1,700 worked in other types of Federal Government positions—chiefly in the hospitals and clinics of the Veterans Administration and the Public Health Service.

## Training, Other Qualifications, and Advancement

A license to practice dentistry is required in all States and the District of Columbia. To qualify for a license in most States, a candidate must graduate from a dental school approved by the American Dental Association and pass written and practical examinations. In 1980, candidates in 48 States and the District of Columbia could fulfill part of the State licensing requirements by passing a written examination given by the National Board of Dental Examiners. Most State licenses permit dentists to engage in both general and specialized practice. In 14 States, however, a dentist cannot be licensed as a "specialist" without having 2 or 3 years of graduate education and, in some cases, passing a special State examination. In the other 36 States, the extra education also is necessary, but a specialist's practice is regulated by the dental profession, not the State licensing authority. To practice in a different State, a licensed dentist usually must pass that State's examination. However, at least 21 States grant licenses to dentists from other States on the basis of their credentials. Dentists who want to teach or do research usually spend an additional 2 to 4 years in advanced dental training in programs operated by dental schools, hospitals, and other institutions of higher education.

Dental schools require a minimum of 2 to 4 years of college-level predental education. In fact, most dental students are college graduates. Five out of six of the students entering dental schools in 1980 had a bachelor's or master's degree. Predental education must include courses in the sciences and humanities.

Competition is keen for admission to dental schools. In selecting students, schools give considerable weight to college grades. In addition, all dental schools participate in a nationwide admission testing program, and scores earned on these tests are considered along with information gathered about the applicant through recommendations and in-

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terviews. Many State-supported dental schools give preference to residents of their particular States.

Dental school generally lasts 4 academic years, although one institution condenses the program into 3 calendar years. Studies begin with classroom instruction and laboratory work in basic sciences including anatomy, microbiology, biochemistry, and physiology. Courses in preclinical technique and beginning courses in clinical sciences also are provided at this time. The last 2 years are spent chiefly in dental clinics, treating patients.

The degree of Doctor of Dental Surgery (D.D.S) is awarded by most dental colleges. An equivalent degree, Doctor of Dental Medicine (D.M.D.), is conferred by 19 schools.

Earning a dental degree is a costly process, but financial aid is available from the Federal and State governments, health-related organizations, industry, and dental schools themselves. Many dental students rely on student loans to finance their professional training.

Dentistry requires both manual skills and a high level of diagnostic ability. Dentists should have good visual memory, excellent judgment of space and shape, and a high degree of manual dexterity, as well as scientific ability. Good business sense, self-discipline, and the ability to instill confidence are helpful for success in private practice. High school students who want to become dentists are advised to take courses in biology, chemistry, health, and mathematics.

Most dental graduates open their own offices or purchase established practices. Some gain experience with established dentists and save money to equip an office; others may enter residency training programs in approved hospitals. Dentists who enter the Armed Forces are commissioned as captains in the Army and Air Force and as lieutenants in the Navy. Graduates of recognized dental schools are eligible for positions in the Federal service and for commissions (equivalent to lieutenants in the Navy) in the U.S. Public Health Service.

## Job Outlook

Employment opportunities for dentists are expected to be good through the 1980's. Dental school enrollments have grown in recent years, and the supply of new dentists is expected to be in balance with the number needed to fill openings created by growth of the occupation and by death or retirement from the profession.

Employment of dentists is expected to grow about as fast as the average for all occupations due to population growth, increased awareness that regular dental care helps prevent and control dental diseases, and the expansion of prepayment arrangements, which make it easier for people to afford dental services. Fluoridation of community water supplies and improved dental hygiene prevent tooth and gum disorders and preserve teeth that might otherwise be extracted. However, since the preserved teeth may need care in the future, these measures may increase rather than decrease the demand for dental care. Similarly, while new techniques, equipment, and drugs, as well as the expanded use of dental hygienists, assistants, and laboratory technicians, should enable individual dentists to care for more patients, these developments are not expected to offset the need for more dentists.

There will continue to be a need for dentists to administer dental public health programs and teach in dental colleges. Also, many dentists will continue to serve in the Armed Forces.

Except for emergencies, dental work generally can be postponed. During periods of economic hardship, therefore, dentists could experience a reduction in the volume of work, and in earnings—especially in communities affected by mass layoffs. Employment of dentists is not significantly influenced by changes in economic conditions, however.

## Earnings

During the first year or two of practice, dentists often earn little more than the minimum needed to cover expenses, but their earnings usually rise rapidly as their practice develops. Specialists generally earn considerably more than general practitioners. The average income of dentists in 1980 was about $55,000 a year, according to the limited information available. In the Federal Government, new graduates of dental schools could expect to start at $22,500 a year in 1981. Experienced dentists working for the Federal Government in 1980 averaged $43,000; some earned as much as $52,100.

Location is one of the major factors affecting the income of dentists who open their own offices. For example, in high-income urban areas, dental services are in great demand. However, a practice can be developed most quickly in small towns, where new dentists can become known easily and where they may face less competition from established practitioners. Although the income from practice in small towns may rise rapidly at first, over the long run the level of earnings, like the cost of living, may be lower than it is in larger communities.

## Related Occupations

Dentists examine, diagnose, and treat various oral diseases and abnormalities. Others whose work involves personal contact and requires a long and rigorous period of scientific training include psychologists, optometrists, physicians, veterinarians, and podiatrists.

## Sources of Additional Information

For information on dentistry as a career and a list of accredited dental schools, contact:

American Dental Association, Council on Dental Education, 211 E. Chicago Ave., Chicago, Ill. 60611.

American Association of Dental Schools, 1625 Massachusetts Ave. NW., Washington, D.C. 20036.

The American Dental Association also will furnish a list of State boards of dental examiners. Persons interested in practicing dentistry should obtain the requirements for licensure from the board of dental examiners of the State where they plan to work.

Prospective dental students should contact the office of student financial aid at the schools to which they apply for information on scholarships, grants, and loans, including Federal financial aid for dental students.

# Optometrists

(D.O.T. 079.101-018)

## Nature of the Work

Half the people in the United States wear glasses or contact lenses. Optometrists (doctors of optometry) provide most of the vision care these people need. They examine people's eyes to detect vision problems, diseases, and other abnormal conditions. They also test to insure that the patient has proper depth and color perception and the ability to focus and coordinate the eyes. When necessary, they prescribe lenses and treatment. Where evidence of disease is present, the optometrist refers the patient to the appropriate health care practitioner. Most optometrists supply the prescribed eyeglasses and fit and adjust contact lenses. Optometrists also prescribe vision therapy or other treatment which does not require surgery. In 32 States optometrists may utilize diagnostic drugs; in several of these States they may also utilize drugs to treat eye diseases.

Although most optometrists are in general practice, some specialize in work with the elderly or with children. Others work with partially sighted persons, who use microscopic or telescopic lenses. Still others concentrate on contact lenses or vision therapy. Optometrists teach, do research, consult, and serve on health advisory committees of various kinds.

Optometrists should not be confused with either ophthalmologists or dispensing opticians. Ophthalmologists are physicians (doctors of medicine or osteopathy) who specialize in medical eye care, eye diseases, and injuries; perform eye surgery; and prescribe drugs or other eye treatment, as well as lenses. Dispensing opticians fit and adjust eyeglasses according to prescriptions written by ophthalmologists or optometrists; they do not examine eyes or prescribe treatment. (See statements on physicians and dispensing opticians elsewhere in the *Handbook*.)

## Working Conditions

Optometrists work in places—usually their own offices—that are clean, well lighted, and comfortable. The work requires a lot of attention to detail. Because optometrists, like other health practitioners, generally are self-employed, they have considerable flexibility

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in setting their hours of work, and often continue to practice after the normal retirement age. Many independent practitioners work well over 40 hours a week, including time on Saturdays and in the evening.

## Employment

In 1980, there were about 27,000 practicing optometrists. More than 9 out of 10 worked full time. Although the majority of optometrists are in solo practice, a growing number are in partnerships or group practices. The trend toward partnerships or group practices, which is especially pronounced among younger optometrists, is associated with the high cost of setting up a solo practice. For the same reason, some optometrists work as salaried employees in the offices of other optometrists.

Some optometrists work in specialized hospitals and eye clinics or teach in schools of optometry. Others work for the Veterans Administration, health maintenance organizations, public and private health agencies, and insurance companies.

Some optometrists in private practice also act as consultants to industrial safety engineers, insurance companies, manufacturers of corrective lenses, and others.

## Training, Other Qualifications, and Advancement

All States and the District of Columbia require that optometrists be licensed. Applicants for a license must have a Doctor of Optometry degree from an accredited optometric school or college and pass a State board examination. In some States, applicants can substitute the examination of the National Board of Examiners in Optometry, given in the second, third, and fourth years of optometric school, for part or all of the written State examination. Some States allow applicants to be licensed without lengthy examination if they have a license in another State. In 44 States, optometrists must earn continuing education credits in optometry to renew their licenses.

The Doctor of Optometry degree requires a minimum of 6 or 7 years of higher education consisting of a 4-year professional degree program preceded by at least 2 or 3 years of preoptometric study at an accredited university, college, or junior college. Most optometry students enter with at least a bachelor's degree. In 1981, there were 13 schools and colleges of optometry in the United States accredited by the Council on Optometric Education of the American Optometric Association; accreditation was pending for 3 other schools. Requirements for admission to these schools usually include courses in English, mathematics, physics, chemistry, and biology or zoology. Some schools also require courses in psychology, social studies, literature, philosophy, and foreign languages. All applicants must take the Optometry College Aptitude Test (OCAT). Admission to optometry schools is keenly competitive. Therefore, superior grades in preoptometric college courses may enhance one's chances for acceptance.

Optometrist uses instruments to measure patient's vision.

Because most optometrists are self-employed, business ability, self-discipline, and the ability to deal with patients tactfully are necessary for success.

Many beginning optometrists enter into associate practice with an optometrist or other health professional. Others purchase an established practice or set up a new practice. Some take salaried positions to obtain experience and the necessary funds to enter their own practice.

Optometrists wishing to advance in a specialized field may study for a master's or Ph.D. degree in visual science, physiological optics, neurophysiology, public health, health administration, health information and communication, or health education. One-year graduate clinical residency programs also are available in the optometric specialties of family practice optometry, pediatric optometry, low vision rehabilitation, contact lenses, neuro-optometry, and hospital optometry. Optometrists who enter the Armed Forces as career officers have the opportunity to work toward advanced degrees and to do research on vision problems.

## Job Outlook

Employment opportunities for optometrists are expected to be favorable through the 1980's. The number of graduates from the Nation's 16 schools of optometry is expected to be roughly equal to the number of positions that will arise from growth in the demand for optometrists and the need to replace optometrists who retire or die.

Employment of optometrists is expected to grow about as fast as the average for all occupations. An increase in the total population and the rising proportion of older peo-

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ple—the group most likely to need vision care—are major factors contributing to the expected growth in the occupation. Greater recognition of the importance of good vision and the broadening of public and private health insurance coverage to include optometric services also should increase the demand for optometric services.

## Earnings

In 1980, net earnings of new optometry graduates in their first full year of practice averaged about $18,000. Experienced optometrists averaged about $45,000 annually. Optometrists working for the Federal Government earned an average of $28,500 a year in 1980. Incomes vary greatly, depending upon location, specialization, and other factors. Optometrists who start out by working on a salaried basis tend to earn more money initially than optometrists who set up their own solo practice. However, in the long run, those with their own private practice have the potential to earn more than those employed by other optometrists, hospitals, health agencies, retail stores, or other firms.

## Related Occupations

Other occupations in which the main activity consists of applying logical thinking and scientific knowledge to prevent, diagnose, and treat disease, disorders, or injuries in humans or animals are chiropractors, dentists, osteopathic physicians, physicians, podiatrists, and veterinarians.

## Sources of Additional Information

For information on optometry as a career, write to:

American Optometric Association, 243 North Lindbergh Blvd., St. Louis, Mo. 63141.

Additional career information and a listing of accredited optometric educational institutions as well as required preoptometry courses can be obtained from:

Association of Schools and Colleges of Optometry, Suite 410, 600 Maryland Ave. SW., Washington, D.C. 20024.

The Board of Optometry in the capital of each State can supply information on licensing requirements.

For information on admission requirements and sources of financial aid, including Federal loans and scholarships, contact individual optometry schools.

# Osteopathic Physicians

(D.O.T. 071.101-010)

## Nature of the Work

Osteopathic physicians (D.O.'s) diagnose and treat diseases or maladies of the human body. They place special emphasis on the musculo-skeletal system of the body—bones, muscles, ligaments, and nerves. One of the basic treatments or therapies used by osteopathic physicians centers on manipulating this system with the hands. Osteopathic physicians also use surgery, drugs, and all other accepted methods of medical care.

Most osteopathic physicians are "family doctors" who engage in general practice. These physicians usually see patients in their offices, make house calls, and treat patients in osteopathic and other private and public hospitals. Some doctors of osteopathy teach, do research, or write and edit scientific books and journals.

In recent years, specialization has increased. In 1980, about 13 percent of all osteopathic physicians were practicing in specialties, including internal medicine, neurology and psychiatry, ophthalmology, anesthesiology, physical medicine and rehabilitation, dermatology, pathology, proctology, radiology, and surgery.

## Working Conditions

Many osteopathic physicians work more than 50 or 60 hours a week. Those in general practice usually work longer and more irregular hours than specialists. As osteopathic physicians grow older, they may accept fewer new patients and tend to work shorter hours. However, many continue to practice well beyond 70 years of age.

## Employment

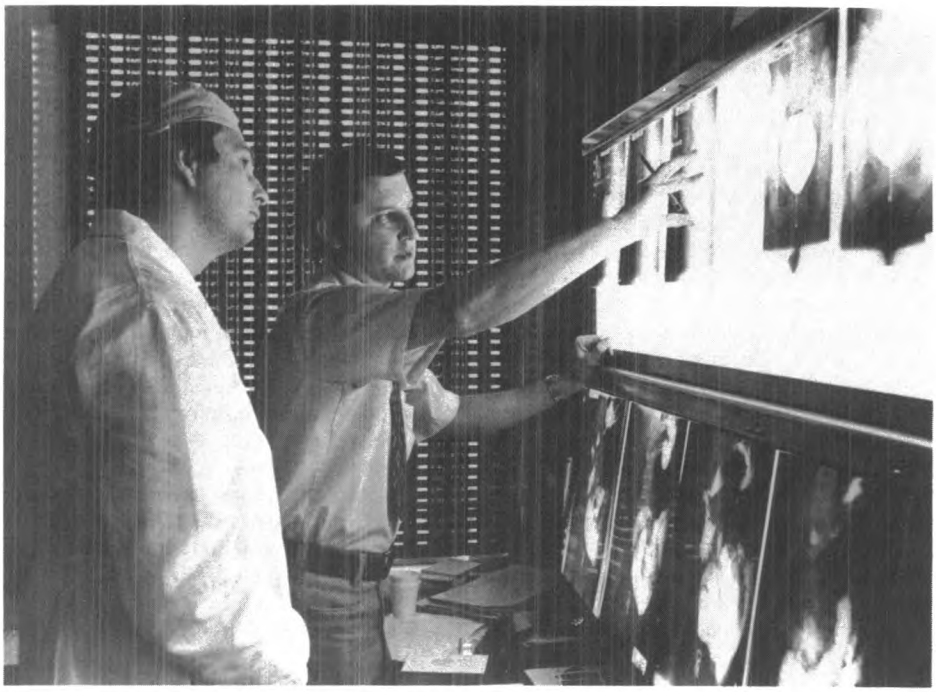
About 18,750 osteopathic physicians practiced in the United States in 1980, according to American Osteopathic Association (A.O.A.) estimates. Almost 85 percent were in private practice. A small number were full-time staff or faculty members of osteopathic hospitals and colleges, private industry, or government agencies.

Osteopathic physicians are located chiefly in those States that have osteopathic hospital facilities. In 1980, three-fifths of all osteopathic physicians were in Florida, Michigan, Pennsylvania, New Jersey, Ohio, Texas, and Missouri. Twenty-one States and the District of Columbia each had fewer than 50 osteopathic physicians. More than half of all general practitioners are located in towns and cities having fewer than 50,000 people; specialists, however, practice mainly in large cities.

## Training and Other Qualifications

All 50 States and the District of Columbia require a license to practice osteopathic medicine. To obtain a license, a candidate must be a graduate of an approved school of osteopathic medicine and pass a State board examination. In four States, candidates must pass an examination in the basic sciences before they are eligible to take the professional examination; 38 States and the District of Columbia also require a period of internship in an approved hospital after graduation from an osteopathic school. The National Board of Osteopathic Examiners also gives an examination which is accepted by most States as a substitute for the State examination. Most States grant licenses without further examination to osteopathic physicians already licensed by another State.

The minimum educational requirement for entry to one of the schools of osteopathic medicine is 3 years of college work, but in practice almost all osteopathic students have a bachelor's degree. Preosteopathic education must include courses in chemistry, physics, biology, and English. Osteopathic colleges require successful completion of 3 to 4 years of professional study for the degree of Doctor of Osteopathy (D.O.). During the first half of professional training, emphasis is



Osteopathic physicians usually set up practice in communities that have osteopathic hospitals.

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placed on basic sciences, such as anatomy, physiology, and pathology, and on the principles of osteopathy; the remainder of the time is devoted largely to experience with patients in hospitals and clinics.

After graduation, nearly all doctors of osteopathic medicine serve a 12-month rotating internship (including experience in surgery, pediatrics, internal medicine and other specialties) at 1 of the 94 osteopathic hospitals approved by the American Osteopathic Association for intern or residency training. Those who wish to specialize must have 2 to 5 years of additional training.

The osteopathic physician's lengthy training is very costly. Federal and private loans are available to help students meet these costs. In addition, Federal scholarships are available to qualified applicants who agree to a minimum of 3 years' military service after graduation.

In late 1981, there were 15 schools of osteopathic medicine. Schools admit students on the basis of their college grades, scores on the required New Medical College Admissions Test, and recommendations from premedical college counselors. The applicant's desire to serve as an osteopathic physician rather than as a doctor trained in other fields of medicine is an important qualification. Colleges also give considerable weight to a favorable recommendation by an osteopathic physician familiar with the applicant's background.

Newly qualified doctors of osteopathic medicine usually establish their own practice, although a growing number enter group practice and some enter government service. Some work as assistants to experienced physicians or join the staff of osteopathic or allopathic (M.D.) hospitals. In view of the variation in State laws, persons who wish to become osteopathic physicians should study carefully the professional and legal requirements of the State in which they plan to practice. The availability of osteopathic hospitals and clinical facilities also should be considered.

Persons who wish to become osteopathic physicians must have a strong desire to pursue this career. They must be willing to study a great deal throughout their career in order to keep up with the latest advances in osteopathic medicine. They should exhibit leadership, emotional stabiliy, and self-confidence. A pleasant personality, friendliness, patience, and the ability to deal with people also are important.

## Job Outlook

Opportunities for osteopathic physicians are expected to be favorable through the 1980's. Many localities are without medical practitioners of any kind; many more have few or no osteopathic physicians. In addition, many new osteopaths will be needed to replace those who retire or die. The greatest demand probably will continue to be in States where osteopathic medicine is a widely known and accepted method of treatment, such as Pennsylvania, Florida, and several Midwestern States. Generally, prospects for beginning a successful practice are likely to be best in rural areas, small towns, and city suburbs, where young doctors of osteopathy may establish their professional reputations more easily than in the large cities.

The osteopathic profession is expected to grow faster than the average for all occupations through the 1980's because of general population growth and the rising proportion of elderly persons, the establishment of additional osteopathic hospital facilities, and the extension of third-party payment programs for hospitalization and medical care.

## Earnings

In osteopathic medicine, as in many of the other health professions, income usually rises markedly after the first few years of practice. Earnings of individual practitioners are determined mainly by ability, experience, geographic location, and the income level of the community served. Graduates who had completed an approved 3-year residency but had no other experience received a starting salary at a Veterans Administration hospital of about $38,000 a year in 1981. In addition, those who worked full time received up to $13,000 in other cash benefits or "special" payments. In general, the income earned by D.O.'s compares favorably with other professions. Specialists usually earn higher incomes than general practitioners.

## Related Occupations

Osteopathic physicians work to prevent, diagnose, and treat diseases, disorders, and injuries. Other occupations that require the exercise of similar critical judgments include: Audiologists, chiropractors, dentists, optometrists, physicians, podiatrists, speech pathologists, and veterinarians.

## Sources of Additional Information

People who wish to practice in a particular State should find out about the requirements for licensure directly from the board of examiners of that State. Information on Federal scholarships and loans is available from the director of student financial aid at the individual schools of osteopathy. Information about Armed Forces Health Professional Scholarships is available from any local military recruiting office. For a list of State boards, as well as general information on osteopathy as a career, contact:

American Osteopathic Association, Department of Public Relations, 212 East Ohio St., Chicago, Ill. 60611.

American Association of Colleges of Osteopathic Medicine, 4720 Montgomery Lane, Bethesda, Md. 20814.

# Physicians

(D.O.T. 070.061-010 through .107-014)

## Nature of the Work

Physicians perform medical examinations, diagnose diseases, and treat people who are suffering from injury or disease. They also advise patients on how to prevent disease and keep fit through proper diet and exercise. Physicians generally work in their own offices and in hospitals, but they also may visit patients in their homes or in nursing homes.

Depending on the type of patients they see, physicians may be either generalists or specialists. About three out of ten physicians who provide patient care are generalists, and these include general practitioners (G.P.'s) as well as a number of specialty-trained practitioners, such as family practitioners and some practitioners in family medicine and pediatrics, who provide general, all-around health care. Recent years have seen a decline in the number of G.P.'s. Instead, almost all medical school graduates obtain advanced specialty training in a residency program. The largest of the 38 specialties for which there is postgraduate training are internal medicine, general surgery, obstetrics and gynecology, psychiatry, pediatrics, radiology, anesthesiology, ophthalmology, pathology, and orthopedic surgery. The most rapidly growing specialties are in the primary care area—family practice, internal medicine, and pediatrics.

Some physicians combine the practice of medicine with research or teaching in medical schools. Others hold full-time research or teaching positions or perform administrative work in hospitals.

## Working Conditions

Many physicians have long working days and irregular hours. Most specialists work fewer hours each week than general practitioners. As doctors approach retirement age, they may accept fewer new patients and tend to work shorter hours. However, many continue in practice well beyond 70 years of age.

## Employment

There were about 405,000 active physicians in the United States in 1980, according to the American Medical Association (A.M.A.). About 263,000 of these had office practices; more than 104,000 others worked as residents or full-time staff members in hospitals. The remaining physicians—almost 38,000—taught or performed administrative or research duties.

In 1980, 12,000 graduates of foreign medical schools served as hospital residents in this country. To be appointed to approved residencies in U.S. hospitals, alien graduates of foreign medical schools usually must be certified by the Educational Commission for Foreign Medical Graduates after having passed an examination administered by that organization.

The Northeast has the highest ratio of physicians to population and the South has the lowest. Because physicians have tended to locate in urban areas, close to hospital and educational centers, many rural areas have been underserved by medical personnel. Currently, more medical students are being exposed to practice in rural communities with

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the direct support of educational centers and hospitals in more populous areas. In addition, some rural areas offer physicians guaranteed minimum incomes to offset the relatively low earnings typical in rural medical practice.

## Training and Other Qualifications

All States, the District of Columbia, and Puerto Rico require a license to practice medicine. Requirements for licensure include graduation from an accredited medical school, successful completion of a licensing examination, and, in most States, 1 or 2 years of supervised practice in an accredited graduate medical education program (residency). The licensing examination taken by most graduates of U.S. medical schools is the National Board of Medical Examiners (NBME) test that is accepted by all States except Texas and Louisiana. Graduates of foreign medical schools as well as graduates of U.S. medical schools who have not taken the NBME test must take the Federation Licensure Examination (FLEX) that is accepted by all jurisdictions. Although physicians licensed in one State usually can get a license to practice in another without further examination, some States limit this reciprocity.

In 1980, there were 126 accredited schools in the United States in which students could begin the study of medicine. Of these, 125 awarded the degree of Doctor of Medicine (M.D.); 1 school offered a 2-year program in the basic medical sciences to students who could then transfer to another medical school for the last semesters of study.

The minimum educational requirement for entry to a medical school is 3 years of college; some schools require 4 years. A few medical schools allow selected students who have exceptional qualifications to begin their professional study after 2 years of college. Most students who enter medical schools have a bachelor's degree.

As the supply of physicians grows, opportunities will be better in some specialties than in others.

Required premedical study includes undergraduate work in English, physics, biology, and inorganic and organic chemistry. Students also should take courses in the humanities, mathematics, and the social sciences to acquire a broad general education. Recent studies have shown that medical students with undergraduate majors in the humanities did as well in their medical studies as those who majored in the sciences.

Medicine is a popular field of study, and applicants must compete for entry with highly motivated students who generally excelled in premedical education. Factors considered by medical schools in admitting students include their academic record and their scores on the New Medical College Admission Test, which is taken by almost all applicants. Consideration also is given to the applicant's character, personality, and leadership qualities, as shown by personal interviews, letters of recommendation, and extracurricular activities in college. Many State-supported medical schools give preference to residents of their particular State and, sometimes, those of nearby States.

Most medical students take 4 years to complete the curriculum for the M.D. degree. Some schools, however, allow students who have demonstrated outstanding ability to follow a shortened curriculum, generally lasting 3 years. A few schools offer the M.D. degree within 6 years of high school graduation.

The first semesters of medical school are spent primarily in laboratories and classrooms, learning basic medical sciences such as anatomy, biochemistry, physiology, pharmacology, microbiology, and pathology. Additionally, students gain some clinical experience with patients during the first 2 years of study, learning to take case histories, perform examinations, and recognize symptoms. During the last semesters, students spend most of their time in hospitals and clinics under the supervision of clinical faculty, where they gain experience in the diagnosis and treatment of illness.

After graduating from medical school, almost all M.D.'s serve a residency of at least 3 years. Those planning a career as a generalist spend 3 years in a family practice, general internal medicine or pediatrics residency. Almost 95 percent of medical school graduates expect to seek specialty board certification. Those doctors must select an approved residency program, pass the board's certification examination, and meet any other certification board requirements. Some physicians who want to teach or do research take graduate work leading to a master's or Ph.D. degree in a field such as biochemistry or microbiology.

Medical training is very costly because of the long time required to earn the medical

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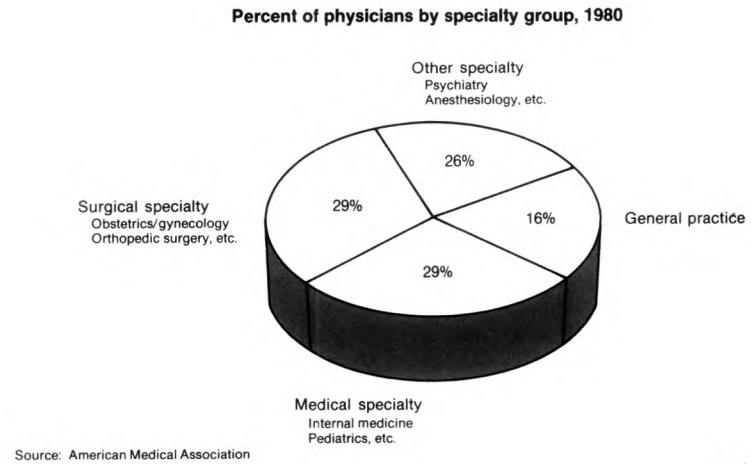
degree. However, financial assistance in the form of loans and scholarships is available from the Federal Government, State and local governments, and private sources. Some of this aid requires the student to demonstrate financial need or to commit a minimum of 3 years' time to service in the Armed Forces upon graduation.

Persons who wish to become physicians must have a strong desire to serve the sick and injured. They must be self-motivated and competitive to survive the pressures of premedical and medical education and the demanding workload during the residency that follows medical school. They must be willing to study a great deal in order to keep up with the latest advances in medical science. Sincerity and a pleasant personality are assets that help physicians gain the confidence of patients. Physicians should be emotionally stable and able to make decisions in emergencies.

The majority of newly qualified physicians open their own offices or join associate or group practices. Those who have completed 1 year of graduate medical education (a 1-year residency) and enter active military duty initially serve as captains in the Army or Air Force or as lieutenants in the Navy. Graduates also qualify for professional medical positions in the Federal service.

## Specialists outnumber general practitioners by 5 to 1




Source: American Medical Association

## Job Outlook

The employment outlook for physicians is expected to be favorable through the 1980's. However, the shortage of physicians clearly is past, except for rural and inner city areas that continue to have difficulty attracting medical personnel. Medical school enrollments have increased and new graduates, combined with foreign medical graduates seeking to practice here, will continue to increase the supply of physicians throughout the 1980's. In some areas considered very desirable, evidence of an oversupply of physicians is emerging. This phenemenon is expected to become more common in coming years and should encourage doctors to plan carefully in selecting a specialization and a location in which to practice. New physicians should have little difficulty establishing a practice, provided they are willing to locate where doctors are not in oversupply.

A greater percentage of new medical graduates are entering the primary care specialties, and this may help alleviate a critical shortage of this type practitioner in many localities. With more physicians in primary care there may be an increasing movement of physicians into rural and other areas that have experienced shortages in the past.

Growth in population will create much of the need for more physicians. In addition, a larger percentage of the population will be in the age group over 65, which uses more physicians' services. The effective demand for physicians' care is expected to increase because of greater ability to pay, resulting from widespread availability of prepayment programs for hospitalization and medical care, including Medicare and Medicaid. In addition, more physicians will be needed for medical research and for the growing fields of public health, rehabilitation, industrial medicine, and mental health.

To some extent, the rise in the demand for physicians' services will be offset by developments that raise physicians' productivity. For example, increasing numbers of allied health personnel are assisting physicians; new drugs and medical techniques are shortening illnesses; and growing numbers of physicians are using their time more effectively by engaging in group practice. The use of physician assistants and nurse practitioners also may increase the productivity of physicians.

## Earnings

Stipends of medical school graduates serving as residents in hospitals vary according to the type of residency, geographic area, and size of the hospital, but allowances of $16,000 to $17,000 a year are common. Many hospitals also provide full or partial room, board, and other maintenance allowances to their residents.

Graduates who had completed approved 3-year residencies but had no other medical experience received a starting salary at Veterans' Administration hospitals of about $38,500 a year in 1981. In addition, those working full time received up to $13,000 in other cash benefits or "special" payments.

Newly qualified physicians who establish their own practice must make a sizable financial investment to equip a modern office. During the first year or two of independent practice, physicians probably earn little more than the minimum needed to pay expenses. As a rule, however, their earnings rise rapidly as their practices develop.

Physicians have among the highest average annual earnings of any occupational group. Physicians earned an average net income of $74,500 in 1980. Historically, most specialists, such as radiologists and surgeons, have earned much more than family or general practitioners. However, earnings of family practitioners have risen sharply in recent years. Earnings of physicians depend on factors such as the region of the country in which they practice; the patients' income levels; and the physicians' skills, personality, and professional reputation, as well as the length of experience. Self-employed physicians usually earn more than those in salaried positions.

## Related Occupations

Physicians work to prevent, diagnose, and treat diseases, disorders, and injuries. Other occupations that require similar kinds of skill and critical judgment include audiologists, chiropractors, dentists, optometrists, osteopathic phsyicians, podiatrists, speech pathologists, and veterinarians.

## Sources of Additional Information

Persons who wish to practice in a particular State should inquire about licensure requirements directly from the board of medical examiners of that State. Information on Federal scholarships and loans is available from the directors of student financial aid at medical schools. Information about Armed Forces Health Professions Scholarships is available from any local military recruiting office. For a list of approved medical schools, as well as general information on premedical education, financial aid, and medicine as a career, contact:

Council on Medical Education, American Medical Association, 535 N. Dearborn St., Chicago Ill. 60610.

Association of American Medical Colleges, Suite 200, One Dupont Circle, NW., Washington, D.C. 20036.

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# Podiatrists

(D.O.T. 079.101-022)

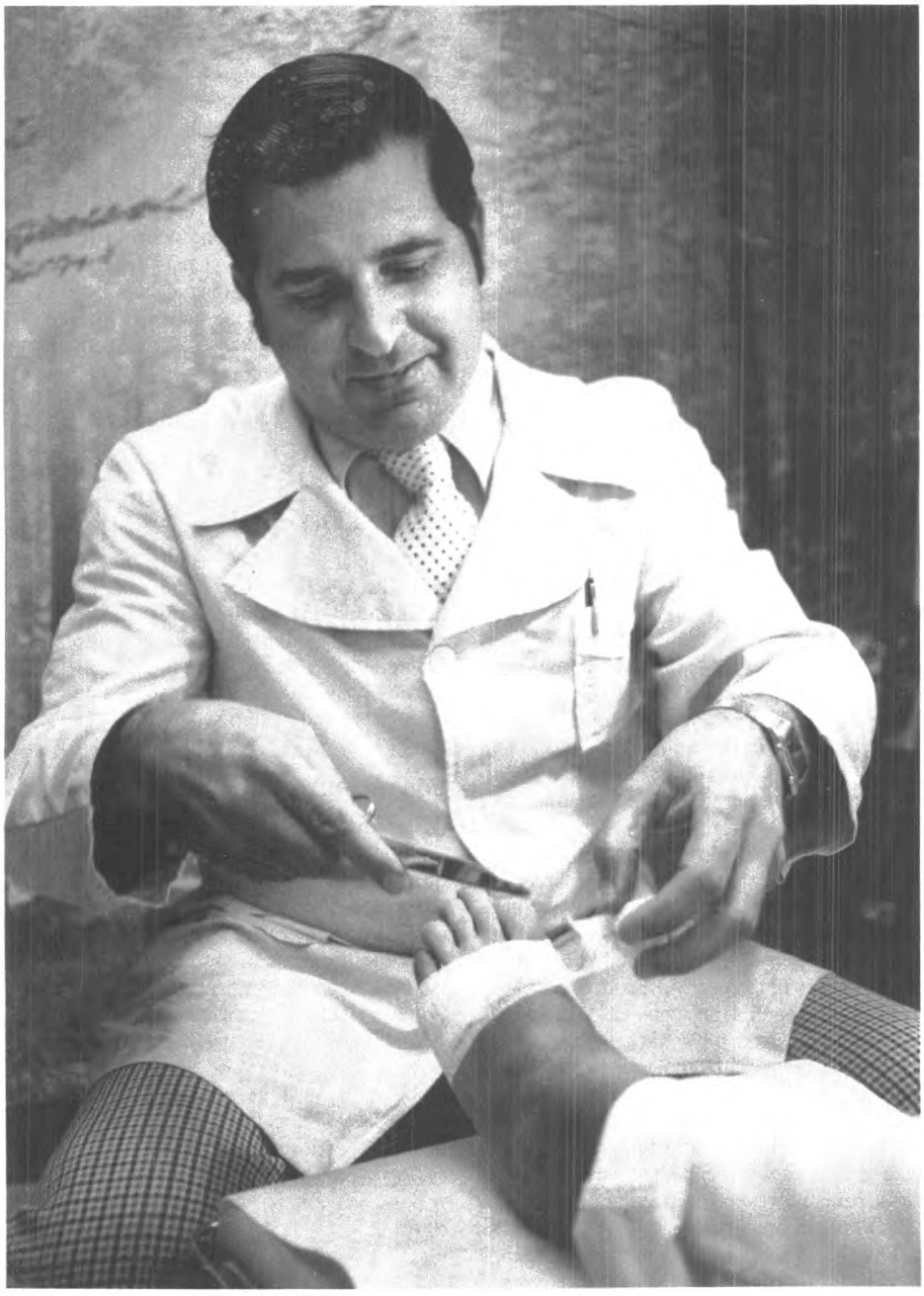
## Nature of the Work

Because we use them so often in walking, running, or just standing, we are constantly and painfully aware when our feet hurt. To get relief, a growing number of foot sufferers are paying a visit to the podiatrist. Podiatrists diagnose and treat diseases and deformities of the foot. They perform surgery; fit corrective devices; and prescribe drugs, physical therapy, and proper shoes. To help in diagnoses, they take X-rays and perform or prescribe blood and other pathological tests. Podiatrists treat a variety of foot conditions, including corns, bunions, calluses, ingrown toenails, skin and nail diseases, deformed toes, and arch disabilities. Whenever podiatrists find symptoms of a medical disorder affecting other parts of the body—arthritis, diabetes, or heart disease, for example—they refer the patient to a physician while continuing to treat the foot problem.

More than 4 of every 5 podiatrists are generalists who provide all types of foot care. However, some podiatrists specialize in foot surgery, orthopedics (bone, muscle, and joint disorders), podopediatrics (children's foot ailments), or podogeriatrics (foot problems of the elderly). With the growing popularity of jogging, tennis, racquetball, and other fast-moving sports, the specialty of sports medicine is also showing rapid growth.

## Working Conditions

Podiatrists usually work independently in their own offices. Their work week is generally 40 hours, and they may set their hours to suit their practice.



Podiatrists diagnose and treat foot problems.

## Employment

Of the 12,000 podiatrists active in 1980, the majority were located in large cities. Those who had full-time, salaried positions worked mainly in hospitals, podiatric medical colleges, or for other podiatrists. The Veterans Administration and public health departments employ podiatrists on either a full- or part-time basis. Others serve as commissioned officers in the Armed Forces.

## Training, Other Qualifications, and Advancement

All States and the District of Columbia require a license for the practice of podiatry. To qualify for a license, an applicant must graduate from an accredited college of podiatric medicine and pass a written and oral State board proficiency examination. Six States—Arizona, Georgia, Michigan, New Jersey, Oklahoma, and Rhode Island—also require applicants to serve a 1-year residency in a hospital or clinic after graduation. Three-fourths of the States grant licenses without further examination to podiatrists already licensed by another State.

The five colleges of podiatric medicine are located in California, Illinois, New York, Pennsylvania, and Ohio. Minimum entrance requirements at these schools include 3 years of college work with courses in English, chemistry, biology or zoology, physics, and mathematics. Competition for entry to these schools is keen, however, and most entrants surpass the minimum requirements. About 85 percent of the class entering in 1980 held at least a bachelor's degree, and the average enrollee had an overall grade point average of "B" or better. All colleges of podiatric medicine also require applicants to earn an acceptable score on the New Medical College Admissions Test. Of the 4 years in podiatry school, the first 2 are spent in classroom instruction and laboratory work in anatomy, bacteriology, chemistry, pathology, physiology, pharmacology, and other basic sciences. During the final 2 years, students gain clinical experience while continuing their academic studies. The degree of Doctor of Podiatric Medicine (D.P.M.) is awarded to graduates. Additional education and experience generally are necessary to practice in a specialty. Federal, State, and private loans are available for needy students to pursue full-time study leading to a degree in podiatric medicine, and some Federal scholarships are available for students willing to locate in underserved areas after graduation.

Persons planning a career in podiatry should have scientific aptitude and manual dexterity, and like detailed work. A good business sense and congeniality also are assets in the profession.

Most newly licensed podiatrists set up their own practices. Some purchase established practices, or take salaried positions to

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gain the experience and money they need to begin their own practice.

## Job Outlook

Opportunities for graduates to establish new practices, as well as to enter salaried positions, should be favorable through the 1980's.

Employment of podiatrists is expected to grow faster than the average for all occupations as podiatry gains recognition as a healing art and as an expanding population demands more health services. Broader participation in fast-moving sports that tend to aggravate foot disorders, as well as the growing number of older people who need foot care and who are entitled to certain podiatrists' services under Medicare, also should spur demand.

## Earnings

Newly licensed podiatrists build their practices over a number of years. Income during the first several years is usually low but generally rises significantly as the practice grows. A net income of over $50,000 a year is common for established podiatrists. Newly licensed podiatrists hired by Veterans Administration hospitals earned starting salaries between $22,486 and $26,951 in 1980.

## Related Occupations

Podiatrists work to prevent, diagnose, and treat diseases, disorders, and injuries. Other occupations that require similar skills include audiologists, chiropractors, dentists, optometrists, osteopathic physicians, physicians, speech pathologists, and veterinarians.

## Sources of Additional Information

Information on license requirements in a particular State is available from that State's board of examiners in the State capital.

Information on colleges of podiatric medicine, entrance requirements, curriculums, and student financial aid is available from:

American Association of Colleges of Podiatric Medicine, 20 Chevy Chase Circle NW., Washington, D.C. 20015.

For additional information on podiatry as a career, contact:

American Podiatry Association, 20 Chevy Chase Circle NW., Washington, D.C. 20015.

# Veterinarians

(D.O.T. 073. except .361-010)

## Nature of the Work

The doctor who treats your pet poodle or mynah bird, the government official who inspects meats sold at the supermarket, the scientist who heads a medical research team investigating the mysteries of disease—any one of these could be a veterinarian (doctor of veterinary medicine). Veterinarians diagnose, treat, and control animal diseases and injuries. They help prevent the outbreak and spread of animal diseases, some of which can be transmitted to human beings. Veterinarians perform surgery on sick and injured animals and prescribe and administer medicines and vaccines.

Over one-third of all veterinarians treat small animals or pets exclusively. Another one-third treat both large and small animals. Almost 10 percent specialize in the health and breeding of cattle, poultry, sheep, swine, or horses. The remainder are in a variety of practice specialties. Some veterinarians inspect food, investigate disease outbreaks, or work in laboratories as part of Federal and State public health programs. Others teach in veterinary colleges, work in zoos or animal laboratories, or engage in medical research.

## Working Conditions

Veterinarians usually treat pet animals in hospitals and clinics. Those who specialize in large animal practice usually work out of well equipped mobile clinics and drive considerable distances between farms and ranches to care for their animal patients. Veterinarians are sometimes exposed to injury, disease, and infection. Those in private practice often work long hours. Veterinarians in rural areas may have to work outdoors in all kinds of weather. Because they are self-employed, veterinarians in private practice usually can continue working well beyond normal retirement age.

## Employment

About 36,000 veterinarians were professionally active in 1980. Most were in private practice. The Federal Government employed about 2,550 veterinarians, chiefly in the U.S. Department of Agriculture and the U.S. Public Health Service. About 600 more were commissioned officers in the veterinary services of the Army and Air Force. Other employers of veterinarians are State and local governments, international health agencies, colleges of veterinary medicine, medical schools, research laboratories, livestock farms, animal food companies, and pharmaceutical companies.

Veterinarians are located in all parts of the country, and the type of practice generally varies according to geographic setting. Veterinarians in rural areas mainly treat farm animals; those in small towns usually engage in general practice; those in cities and suburban areas often limit their practice to pets.

## Training, Other Qualifications, and Advancement

All States and the District of Columbia require veterinarians to have a license. To obtain a license, applicants must have a Doctor of Veterinary Medicine (D.V.M. or V.M.D.) degree from an accredited college of veterinary medicine and pass written and—in most States—oral State board proficiency examinations. Some States issue licenses without further examination to veterinarians already licensed by another State.

For positions in research and teaching, an additional master's or Ph.D. degree usually is required in a field such as pathology, physiology, toxicology, or laboratory animal medicine.

The D.V.M. or V.M.D. degree requires a minimum of 6 years of college consisting of a 4-year professional degree program preceded by at least 2 years of preveterinary study that emphasizes the physical and biological sciences. Several veterinary medical colleges require 3 years of preveterinary work, and most applicants have completed 4 years of college. In addition to rigorous academic instruction, professional training includes considerable practical experience in diagnosing and treating animal diseases, performing surgery, and performing laboratory work in anatomy, biochemistry, and other scientific and medical subjects.

In 1980, 22 colleges of veterinary medicine in the U.S. were accredited by the Council on Education of the American Veterinary Medical Association. Admission to these schools is highly competitive. Each year there are many more qualified applicants than the schools can accept. Serious applicants usually need grades of "B" or better, especially in science courses. Experience in part-time or summer jobs working with animals is advantageous. Colleges usually give preference to residents of the State in which the college is located, because these schools are largely State supported. In the South and West, regional educational plans permit cooperating States without veterinary schools to send students to designated regional schools. In other areas, colleges that accept out-of-State students give priority to applicants from nearby States that do not have veterinary schools.

The Federal Government provides some scholarships and loans for students in schools of veterinary medicine, subject to the availability of funds; several of the Federal financial assistance programs involve a period of service in an underserved area after graduation.

Most veterinarians begin as employees or partners in established practices. Those who can afford the substantial investment needed for drugs, instruments, and other startup costs may set up their own practices. An even greater investment is needed to open an animal hospital or purchase an established practice.

Newly qualified veterinarians may enter the military services as commissioned officers, or qualify for Federal positions as meat and poultry inspectors, disease-control workers, epidemiologists, research assistants, or commissioned officers in the U.S. Public Health Service. A license is not required for Federal employment.

## Job Outlook

Veterinary employment is expected to grow faster than the average for all occupations through the 1980's, primarily because of growth in the companion animal (horses,

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A third of all veterinarians treat small animals or pets.

dogs, and other pets) population. Emphasis on scientific methods of raising and breeding livestock and poultry and growth in public health and disease control programs also will contribute to heightened demand for veterinarians.

Despite relatively rapid growth in employment, newly qualified veterinarians will face increasing competition in establishing practices, for the number of veterinary school graduates rose sharply in the 1970's and is expected to continue growing. The considerable expense of establishing a practice has prompted more and more graduates to seek employment with established veterinarians until they can finance their own practices. If this trend continues, competition for jobs with existing veterinary practices will grow.

## Earnings

Newly graduated veterinarians employed by the Federal Government started at $21,065 a year in 1981. The average annual salary of veterinarians in the Federal Government was $34,100 in 1980. The average salary paid veterinarians working for local governments was $24,500 in 1980. The incomes of veterinarians in private practice vary considerably, depending on factors such as location, type of practice, and years of experience, but usually are higher than those of veterinarians employed by government agencies.

## Related Occupations

Veterinarians use their professional training to prevent, diagnose, and treat diseases, disorders, and injuries. Others who require similar skills are audiologists, chiropractors, dentists, optometrists, osteopathic physicians, physicians, podiatrists, and speech pathologists.

## Sources of Additional Information

A pamphlet entitled *Today's Veterinarian* presents information on veterinary medicine as a career and lists accredited colleges of veterinary medicine. A free copy may be obtained by submitting a request, together with a self-addressed, stamped business-size envelope, to:

American Veterinary Medical Association, 930 N. Meacham Rd., Schaumburg, Ill. 60196.

Information on opportunities for veterinarians in the U.S. Department of Agriculture is available from:

Animal and Plant Health Inspection Service, Field Service Office, Employment Services, Butler Square West, 5th Floor, 100 N. 6th St., Minneapolis, Minn. 55043.

Food Safety and Quality Service, Personnel Division, Butler Square West, 4th Floor, 100 N. 6th St., Minneapolis, Minn. 55043.

Prospective veterinary students should contact the financial aid officer of the schools to which they apply for admission for information on scholarships, grants, and loans.

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# Registered Nurses, Pharmacists, Dietitians, Therapists, and Physician Assistants

The health professionals described in this section of the *Handbook* care for the sick, help the disabled, and advise individuals and communities on ways of maintaining and improving their health. Nursing is the largest by far of these occupations. More than one million registered nurses were employed in 1980. The other occupations described here vary in size from pharmacists (about 141,000 in 1980) to physician assistants (9,500).

*Registered nurses* are an essential part of the health team and work primarily on hospital staffs, providing direct patient care. A growing number work in long-term care facilities including nursing homes, rehabilitation centers, and mental hospitals. Some engage in community health, industrial, or school nursing, while others work in clinics or physicians' offices or do private duty nursing. With additional specialized training and experience, registered nurses may qualify for jobs as *nurse practitioners*, *nurse midwives*, or *nurse anesthetists*. In these "expanded roles," nurses perform tasks that otherwise would be performed by a physician. Three principal kinds of nursing education programs—diploma, associate degree, and bachelor's degree—prepare students for careers as registered nurses. There are differences among them that should be understood by the prospective nursing student. However, all nursing education programs share the goals of teaching nurses the scientific basis of modern nursing practice, familiarizing them with the latest treatment and rehabilitation techniques, and equipping them to understand patients' social and psychological needs as well as their medical ones.

The relatively new occupation of *physician assistant* involves direct patient care by workers who are specially trained to perform many of the more routine medical tasks normally carried out by a physician. These tasks include taking medical histories, doing routine examinations, and making hospital rounds. Physician assistants work under the supervision of a physician, usually right in the office. Some, however, practice in rural health clinics and other places where physicians are not readily available. Training commonly lasts 2 years; some programs accept as students only people with previous experience in the health field. Legal provisions permitting physician assistants to practice are not uniform throughout the country, in part because the occupation is so new.

*Therapists* work directly with patients who are injured, disabled, or emotionally disturbed, using a variety of techniques to help them regain physical or emotional independence. *Physical therapists* use exercise and other treatments to help patients increase strength, mobility, and coordination. *Occupational therapists* teach skills of everyday living, including vocational skills, to people who are disabled or handicapped. Their goal is to help patients adapt to their limitations and learn to be as self-sufficient as possible. *Speech pathologists and audiologists* work with children and adults who have speech, language, or hearing impairments. Statements describing each of these occupations appear below. *Rehabilitation counselors*, whose work is closely related to that of therapists, are described elsewhere in the *Handbook*.

Mention should be made of a number of other therapists who aid in rehabilitation. *Orientation therapists for the blind* help newly blinded persons learn to move about unassisted; to handle such everyday activities as dressing, grooming, eating, and using the telephone; and to communicate by means of Braille, reading machines, or other devices. *Recreation therapists*, also known as *therapeutic recreation workers*, are trained to use sports, games, crafts, and hobbies as part of the rehabilitation of ill, disabled, or handicapped persons. (See the statement on recreation workers elsewhere in the *Handbook*.) *Art, dance,* and *music therapists* help patients resolve physical, emotional, or social problems through nonverbal means of communication. *Horticultural therapists* use gardening for therapeutic purposes—as a group activity for persons with mental or emotional problems, for example. A bachelor's degree with a health professions specialization is standard preparation for most therapy occupations. For some jobs, a master's degree is essential.

*Dietitians* and *pharmacists* also use special skills and expertise to assist sick or disabled persons, although they do not provide direct patient care. Having completed college programs that include bacteriology, chemistry, and other sciences, these workers draw on a body of scientific knowledge when they devise therapeutic treatment or give advice on the effects of diet or drugs. Both fields offer opportunities to practice in a variety of settings. Dietitians plan diets to meet the nutritional needs of groups as diverse as hospital patients, school children, prisoners, and hotel guests. Pharmacists generally work in hospitals or community pharmacies where they dispense drugs and medicines prescribed by health practitioners. Like other health professionals, dietitians and pharmacists sometimes teach or do consulting work in addition to their primary job.

Pharmacists, physical therapists, and registered nurses must have a license in order to practice. State licensing requirements protect the public by insuring that health care workers meet minimum standards of education and competence. Students considering one of these careers should investigate the State licensing requirements where they plan to work.

Employment in these occupations is expected to grow faster than the average for all occupations through the 1980's. Population growth, especially the increase in the number of older people, will spur demand for health care. During the decade of 1980's, as the number of persons aged 75 and over rises from 9.4 to 12.0 million, demand for a full range of health care services for older persons is bound to increase. However, the availability of public and private health insurance, and insurance terms that prescribe which services are reimbursable, will continue to affect the actual level of employment. Increased coverage for services provided in convalescent institutions and outpatient care facilities, for example, has contributed to employment growth in these areas. While it is clear that employment of health care workers is affected by changes in the extent and terms of insurance coverage, it is not clear what changes in health care financing are likely to occur during the 1980's. Employment in specific professions may increase more or less rapidly than currently anticipated.

In addition to new jobs created by growth of the health field, many openings occur each year due to replacement needs. Turnover is a major reason for the current shortage of nurses in some communities.

Several other sections of the *Handbook* contain statements on health careers. Check the alphabetical index at the back to locate the statements on health services administrators, dental assistants, medical assistants, optometric assistants, occupational therapy assistants, physical therapy assistants, dispensing opticians, ophthalmic laboratory technicians, and dental laboratory technicians.

Books and brochures on health careers are available in libraries, counseling centers, and bookstores. The Sources of Additional Information section at the end of each *Handbook* statement identifies organizations that can

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provide pamphlets, lists of accredited schools, and sources of financial aid. For an overview of jobs in the health field, including some jobs not covered in the *Handbook*, request a copy of "200 Ways to a Health Center" from:

National Health Council, 1740 Broadway, New York, N.Y. 10019.

Another useful publication is the *Health Careers Guidebook*, fourth edition, published in 1979 by the U.S. Department of Labor and the U.S. Department of Health, Education, and Welfare (now the Department of Health and Human Services). It is available for $6.00 from:

Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

# Dietitians

(D.O.T. 077.061-010, .117-010, .127-010, -014, -018, -022, and .167-010)

## Nature of the Work

Nutrition is the science of food and its effect on the body. It is concerned with the nutrients in food, their use in body chemistry, and—in the final analysis—the relationship between diet and health. Dietitians provide nutritional counseling to individuals and groups; set up and supervise food service systems for institutions such as hospitals and schools; and promote sound eating habits through education and research.

In this field, the term "nutritionist" applies to a number of different health professionals involved with food science and human nutrition. Among these are dietitians, food technologists, and home economists. (The work of food technologists is described elsewhere in the *Handbook*.)

Among dietitians, major areas of specialization include administration, education, research, and clinical and community dietetics.

*Administrative dietitians* apply the principles of nutrition and sound management to large-scale meal planning and preparation, such as that done in hospitals, prisons, company cafeterias, schools, and other institutions. They supervise the planning, preparation, and service of meals; select, train, and direct food service supervisors and workers; budget for and purchase food, equipment, and supplies; enforce sanitary and safety regulations; and prepare records and reports. Dietitians who are directors of dietetic departments also decide on departmental policy; coordinate dietetic services with the activities of other departments; and are responsible for the dietetic department budget, which in large organizations may amount to millions of dollars annually.

*Clinical dietitians*, sometimes called therapeutic dietitians, assess nutritional needs, develop and implement nutrition care plans, and evaluate and report the results in hospitals, nursing homes, or clinics. Clinical dietitians confer with doctors and other members of the health care team about patients' nutritional care, instruct patients and their families on the requirements and importance of their diets, and suggest ways to maintain these diets after leaving the hospital or clinic. In a small institution, a dietitian may perform both administrative and clinical duties.

*Community dietitians* or *nutritionists* may counsel individuals and groups on sound nutrition practices to prevent disease, maintain health, and rehabilitate persons recovering from illness. They may engage in teaching and research with a community health focus. This work covers areas such as special diets, meal planning and preparation, and food budgeting and purchasing. Dietitians or nutritionists in this field usually are associated with community health programs; they may be responsible for planning, developing, coordinating, and administering a nutrition program or a nutrition component within the community health program. They work mainly for public and private health and social service agencies, including "meals-on-wheels programs," congregate meals for older Americans, and women-infant children nutritional programs.

*Research dietitians* seek ways to improve the nutrition of both healthy and sick people. They may study nutrition science and education, food management, food service systems and equipment, or how the body uses food. Other research projects may investigate the nutritional needs of the aging, persons who have chronic diseases, or space travelers. Research dietitians need advanced training in this field and usually are employed in medical centers or educational facilities, or they may work in community health programs.

*Dietetic educators* teach dietetics to members of the health care team in medical and educational institutions. Some teach this subject to consumer groups and adult education classes.

## Working Conditions

Although most dietitians work 40 hours a week, dietitians in hospitals may sometimes work on weekends, and those in commercial food services have somewhat irregular hours. Dietitians spend much of their time in clean, well-lighted, and well-ventilated areas, such as research laboratories, classrooms, or offices near food preparation areas. However, they do spend time in kitchens and serving areas that often are hot and steamy. Dietitians working in hospital and clinical settings may have to be on their feet a lot; those involved in consulting spend significant time traveling.

## Employment

About 44,000 persons worked as dietitians in 1980. Part-time work is available in this field; approximately 15 percent of all dietitians work part time.

Health care facilities including hospitals, nursing homes, and clinics are major employers of dietitians, accounting for about 65 percent of the total. About 1,200 work for the Veterans Administration or the U.S. Public Health Service. Colleges, universities, and school systems employ about 10 percent of all dietitians and another 10 percent direct food service systems for child care or residential care facilities. Most of the rest work for public health agencies, restaurants or cafeterias, and large companies that provide food service for their employees. Some are self-employed.

A growing number of dietitians do consulting work. Much of the dietetic supervision for nursing homes, for example, is provided by dietitians working on a consultant basis. Some dietitians have their own consulting firms, while others consult on the side.

## Training, Other Qualifications, and Advancement

A bachelor's degree, with a major in foods and nutrition or institution management, is the basic educational requirement for dietitians. This degree can be earned in about 240 colleges and universities, usually in departments of home economics and food and nutrition sciences. Required college courses include food and nutrition, institution management, chemistry, bacteriology, and physiology. Other courses that also are important are mathematics, data processing, psychology, sociology, and economics. It is also possible to prepare for this profession by receiving an advanced degree in nutrition, food service management, or related sciences and providing evidence of qualifying work experience.

To qualify for professional certification, the American Dietetic Association (ADA) recommends completion of an approved dietetic internship or a coordinated undergraduate program. The internship lasts 6 to 12 months and combines clinical experience under a qualified dietitian with some classroom work. In 1980, 81 internship programs were accredited by the ADA. A growing number of coordinated undergraduate programs have been developed that enable students to complete their clinical experience requirement while obtaining their bachelor's degree. In 1980, there were 77 of these programs offered by medical schools and allied health and home economics departments of colleges and universities. These programs also are accredited by the ADA. Persons meeting the qualifications established by the ADA's Commission on Dietetic Registration and passing the registration examination can become Registered Dietitians (R.D.'s). Continuing education is required to maintain registration.

Experienced dietitians may advance to assistant or associate director or director of a dietetic department. Advancement to higher level positions in teaching and research requires graduate education; public health nutritionists usually must earn a graduate degree. Graduate study in institutional or business administration is valuable to those interested in administrative dietetics. About 30 percent of all dietitians have acquired advanced degrees in related areas.

Persons who plan to become a dietitian should have organizational and administrative ability, as well as high scientific aptitude, and should be able to work well with a

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variety of people. Among the courses recommended for high school students interested in careers as dietitians are home economics, business administration, biology, health, mathematics, and chemistry.

## Job Outlook

Employment of dietitians is expected to grow faster than the average for all occupations through the 1980's to meet the rapidly expanding needs of hospitals and long-term care facilities. The factors that spur demand for health services in general—population growth and the aging of the population, greater health consciousness, and widespread ability to pay for medical care under public and private health insurance programs—also will spur demand for dietitians. In addition, dietitians will be needed in other settings, such as industrial plants and restaurants. Dietitians also will be needed to staff community health programs and to conduct research in food and nutrition. An increasing number of experienced dietitians are entering management positions in private industry. In addition to new jobs, many others will open each year to replace those who transfer to other kinds of work, retire, or die. Opportunities should remain favorable for dietitians who wish to work part time.

In recent years, nursing homes have used (under the supervision of registered dietitians) dietetic assistants trained in vocational-technical schools and dietetic technicians trained in ADA-approved programs in community colleges to help meet the demand for dietetic services. Employment opportunities should continue to be favorable for graduates of these programs.

## Earnings

Entry level salaries of hospital dietitians averaged about $15,800 a year in 1981, according to a national survey conducted by the University of Texas Medical Branch. Some experienced hospital dietitians received as much as $25,872 a year.

The median salary for teaching dietitians was approximately $21,400 in 1980, according to a survey by the American Dietetic Association; for dietetic directors, $23,400; for food service administrators, $19,100; for clinical dietitians, $17,400; for research dietitians, $17,600; and for community dietitians, $17,900.

The entrance salary in the Federal Government for those completing an accredited internship was about $15,200 in early 1981. Beginning dietitians with a master's degree who had completed an internship earned about $18,600. In 1980, the Federal Government paid experienced dietitians average salaries of about $21,900 a year.

Dietitians usually receive benefits such as paid vacations, sick leave, holidays, health insurance, and retirement benefits.

## Related Occupations

Dietitians apply the principles of nutrition in a variety of situations. Other workers with similar duties include food and beverage analysts, food chemists, food technologists, homemakers, home economists, executive chefs, and food service managers.

Dietitians see to it that schoolchildren are served nutritious meals.

## Sources of Additional Information

For information on accredited dietetic internship and coordinated undergraduate programs, scholarships, employment opportunities, registration, and a list of colleges providing training for a professional career in dietetics, contact:

The American Dietetic Association, 430 North Michigan Ave., Chicago, Ill. 60611.

The U.S. Office of Personnel Management, Washington, D.C. 20415, will send information on the requirements for dietitians in Federal Government hospitals and for public health nutritionists and dietitians in the Public Health Service, U.S. Department of Health and Human Services.

# Occupational Therapists

(D.O.T. 076.121-010)

## Nature of the Work

Occupational therapists provide services to people who are mentally, physically, or emotionally disabled. Like most of the other health professionals, occupational therapists usually work as a member of a medical team, which may include a physician, physical therapist, vocational counselor, and other

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professionals. The team members evaluate the patient in terms of their individual specialties and consult with each other to arrive at an overall evaluation of the patient's capacities, skills, and abilities. Together they develop short- and long-term goals and the means by which they may be achieved.

Therapists select activities that are suited to the developmental level, physical capacity, intelligence, and interests of each patient. These activities are designed to develop independence, prepare patients to return to work, develop or restore basic functions, and aid in adjustment to disabilities. Activities of various kinds are the primary therapy tools. For instance, occupational therapists may use woodworking, weaving, or other therapeutic activities to help patients improve motor skills, strength, endurance, concentration, motivation, or other physical and/or mental capacities. Other patients might engage in therapeutic activities that develop the functional skills, abilities, and capacities needed for the tasks of everyday living, such as dressing and eating.

In addition to planning and directing therapeutic activities, occupational therapists may design and make special equipment for disabled patients; make and apply splints; assist in the selection and use of equipment to help patients adapt to their environment and/or impairment; and recommend changes in home or work environments. Although they cannot be expert in all these activities, occupational therapists must know enough about them to understand their therapeutic values and to set them into motion.

Occupational therapists tend to work with certain types of disability and age groups. For instance, approximately 3 out of 5 occupational therapists work principally with persons who have physical disabilities and the rest work with patients who have psychological or emotional problems or developmental deficits. Some work exclusively with children and young adults; others work exclusively with the elderly.

Besides working with patients, occupational therapists supervise student therapists, occupational therapy assistants, volunteers, and auxiliary nursing workers. The chief occupational therapist in a hospital may teach medical and nursing students the principles of occupational therapy. Many therapists supervise occupational therapy departments, coordinate patient activities, or are consultants to public health departments and mental health agencies. Some teach in colleges and universities.

## Working Conditions

Although occupational therapists generally work a standard 40-hour week, they may occasionally have to work evenings or weekends. Their work environment varies according to the setting and available facilities. In a large rehabilitation center, for example, the therapist may work in a spacious room equipped with machines, handtools, and other devices that often generate noise. In a nursing home, the therapist may work in a kitchen, using food preparation as therapy. In a hospital, building blocks or paints may be used as rehabilitation devices. Wherever they work and whatever equipment they use, they generally have adequate lighting and ventilation. The job can be physically tiring because therapists are on their feet much of the time.

Job prospects for occupational therapists are very good.

## Employment

About 19,000 occupational therapists were employed in 1980. More than one-half worked in hospitals, including long-term rehabilitation and psychiatric hospitals. Nursing homes, another major employer, accounted for about 15 percent of all occupational therapists. A number worked for school systems and schools for handicapped children. Most of the others worked in rehabilitation centers, clinics, community mental health centers, home health agencies, and adult day care programs. Some worked in vocational rehabilitation programs. Many occupational therapists work part time.

## Training, Other Qualifications, and Advancement

Educational preparation for this field requires a bachelor's degree. Fifteen States and the District of Columbia require a license to practice occupational therapy. Applicants for a license must have a degree or certificate from an accredited educational program and, to qualify, must pass the State licensure program.

In 1980, the Committees on Allied Health Education and Accreditation of the American Medical Association and the American Occupational Therapy Association accredited programs in occupational therapy offered by 55 colleges and universities. Fifty four of these schools offer a bachelor's degree program, and one offers only a master's degree program. Some of the 55 schools also offer programs leading to a certificate or a master's degree in occupational therapy for students who have a bachelor's degree in another field. A graduate degree often is required for teaching, research, or administrative work.

Course work in occupational therapy programs includes physical, biological, and behavioral sciences and the application of occupational therapy theory and skills. These programs also require students to work for 6 to 9 months in hospitals, health agencies, or schools to gain experience in clinical practice. Graduates of accredited educational programs are eligible to take the American Occupational Therapy Association certification examination to become registered occupational therapists (OTR). Occupational therapy assistants who are certified by the Association (COTA's) and have 4 years of approved work experience also are eligible to take the examination to become registered occupational therapists. COTA's considering

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this path of entry to the occupation should contact the Director of Certification of the American Occupational Therapy Association to identify the types of experience required to qualify for the examination and to determine the availability of suitable work settings.

Entry to educational programs is highly competitive and applicants are screened carefully. Persons considering this profession should have above average academic performance and grades of "B" or better in biology, chemistry, and other high school science courses. In addition to biology and chemistry, high school students interested in a career as an occupational therapist are advised to take courses in health, and the social sciences. College students who consider transferring from another academic discipline to an occupational therapy program in their sophomore or junior year need superior grades because competition for entrance to programs is more intense after the freshman year.

Persons considering this career must be able to work with people of all kinds and all ages, with temperaments and personalities that are likely to be as varied as patient illnesses and handicaps. To gain patients' confidence, it is necessary to have a warm, friendly personality that inspires both trust and respect. In addition to these qualities, it is also necessary to have ingenuity and imagination in adapting activities to individual needs. The potential therapist also needs to be skilled, patient, and resourceful in teaching, since patients often present unusual and difficult learning problems.

Newly graduated occupational therapists generally begin as staff therapists. Advancement is chiefly to supervisory or administrative positions; some therapists pursue advanced education to teach and/or conduct research.

## Job Outlook

Employment opportunities for occupational therapists are expected to be very favorable through the 1980's. Although enrollments in occupational therapy programs are continuing to rise, the number of graduates is expected to fall short of the jobs that will open up due to employment growth and replacement needs.

Employment in this occupation is expected to increase much faster than the average for all occupations due to continued support for rehabilitation programs of various kinds. As existing programs expand and new ones are established, therapists will be needed to staff hospital rehabilitation departments, community health centers, long-term care facilities, psychiatric hospitals, schools for children with developmental and learning disabilities, and home health programs.

## Earnings

Beginning salaries for occupational therapists in hospitals averaged about $16,700 a year in 1981, according to a national survey conducted by the University of Texas Medical Branch. Most experienced occupational therapists earned between $19,000 and $23,000, with some administrators earning more than $30,000 annually.

In early 1981, beginning therapists employed by the Federal Government, most of whom worked for the Veterans Administration, earned starting salaries of about $13,700 a year. The average salary paid occupational therapists with the Federal Government was about $19,300 in 1980.

## Related Occupations

Occcupational therapists use specialized knowledge to help patients prepare to return to work and generally aid them to adjust to their disability. Other workers performing similar duties include orthotists, prosthetists, physical therapists, speech pathologists and audiologists, rehabilitation counselors, therapeutic recreation workers, art therapists, music therapists, and dance therapists.

## Sources of Additional Information

For more information on occupational therapy as a career, write to:

American Occupational Therapy Association, 1383 Piccard Dr., Rockville, Md. 20850.

# Pharmacists

(D.O.T. 074.161-010)

## Nature of the Work

Pharmacists dispense drugs and medicines prescribed by doctors and dentists. They also supply and advise people on the use of many medicines that can be obtained without prescriptions. Pharmacists must understand the use, composition, and effect of drugs and how they are tested for purity and strength. They may maintain patient medication profiles and advise physicians on the proper selection and use of medicines. Compounding—the actual mixing of ingredients to form powders, tablets, capsules, ointments, and solutions—is now only a small part of pharmacists' practice, since most medicines are produced by manufacturers in the dosage and form used by the patient.

Pharmacists employed in community pharmacies may have other duties. Besides dispensing medicines, some pharmacists buy and sell nonpharmaceutical merchandise, hire and supervise personnel, and oversee the general operation of the pharmacy. Other pharmacists, however, operate prescription pharmacies that dispense only medicines, medical supplies, and health accessories.

Pharmacists in hospitals and clinics dispense inpatient and outpatient prescriptions and advise the medical staff on the selection and effects of drugs; they also make sterile solutions, buy medical supplies, teach in schools of nursing and allied health professions, and perform administrative duties. In addition, pharmacists work as consultants to the medical team in matters related to daily patient care in hospitals, nursing homes, and other health care facilities. Their role is crucial to safe, efficient, and proper therapeutic care.

## Working Conditions

Pharmacists usually work in a clean, well-lighted, and well-ventilated area that resembles a small laboratory. Shelves are lined with hundreds of different drug products. In addition, some items are refrigerated and all controlled substances are kept under lock and key. Pharmacists spend a lot of time on their feet.

According to a recent survey, pharmacists average 44 hours a week in their primary work setting. Many pharmacists work in a secondary setting where they average 15 hours a week, often as a consultant to a nursing home or other facility. Pharmacies often are open in the evenings and on weekends, and all States require a licensed pharmacist to be in attendance during pharmacy hours. Self-employed pharmacists often work more hours than those in salaried positions.

## Employment

About 141,000 persons worked as pharmacists in 1980. About 100,000 pharmacists worked in community pharmacies. Of these, about one-fourth owned their own pharmacies; the others were salaried employees. Most of the remaining pharmacists worked for hospitals, pharmaceutical manufacturers, wholesalers, and government and educational institutions. Quite a few community and hospital pharmacists provide service to nursing homes and other health facilities in addition to their primary jobs. As a rule, pharmacy services in nursing homes are provided by independent practitioners rather than by employees salaried by the nursing homes. Some pharmacists work part time.

Pharmacists employed by the Federal Government work chiefly in hospitals and clinics of the Veterans Administration and the U.S. Public Health Service. Other Federal agencies that employ pharmacists—for their drug knowledge, as well as to dispense drugs—include the Department of Defense, the Food and Drug Administration and other branches of the Department of Health and Human Services, and the Drug Enforcement Administration. State and local health agencies and pharmaceutical and other professional associations also employ pharmacists.

Most towns have at least one pharmacy with one pharmacist or more in attendance. Most pharmacists, however, practice in or near cities and in those States that have the largest populations.

## Training, Other Qualifications, and Advancement

A license to practice pharmacy is required in all States, the District of Columbia, and Puerto Rico. To obtain a license, one must graduate from an accredited pharmacy degree

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Pharmacists must pay close attention when filling prescriptions.

program (a few States allow graduation from foreign pharmacy programs), pass a State board examination, and—in all States—have a specified amount of practical experience or serve an internship under the supervision of a licensed pharmacist. Internships generally are served in a community or hospital pharmacy. In 1980, all States except California, Florida, and Hawaii granted a license without reexamination to qualified pharmacists already licensed by another State. Many pharmacists are licensed to practice in more than one State.

At least 5 years of study beyond high school are required to graduate from one of the degree programs accredited by the American Council on Pharmaceutical Education in the 72 colleges of pharmacy. Five years are needed to obtain a Bachelor of Science (B.S.) or a Bachelor of Pharmacy (B.Pharm.) degree, the degrees received by most graduates. Depending on a student's educational background, 6 or 7 years are required for a Doctor of Pharmacy (Pharm.D.) degree. Most pharmacy schools offer the baccalaureate degree, and over one-third also offer the professional doctorate degree; four schools offer only the latter. The Pharm.D. degree as well as the B.S. and B.Pharm. degrees may serve as the entry degree for licensure as a pharmacist.

Admission requirements vary. A few colleges admit students directly from high school. Most colleges of pharmacy, however, require entrants to have completed 1 or 2 years of prepharmacy education in an accredited junior college, college, or university. A prepharmacy curriculum usually emphasizes mathematics and basic sciences, such as chemistry, biology, and physics, but also includes courses in the humanities and social sciences. Because entry requirements vary among colleges of pharmacy, prepharmacy students should inquire about and follow the curriculum pattern required by the college they plan to attend.

The bachelor's degree in pharmacy is the minimum educational qualification for most positions in the profession. An increasing number of students are enrolled in advanced professional programs leading to the Pharm.D. degree. A master's or Ph.D. degree in pharmacy or a related field usually is required for research work, and a Pharm.D., master's, or Ph.D. usually is necessary for administrative work or college teaching. Although a number of pharmacy graduates interested in further training pursue an advanced degree in pharmacy, there are other options. Some enter medical, dental, or law school, and others pursue graduate degrees in related disciplines.

Areas of special study include pharmaceutics and pharmaceutical chemistry (physical and chemical properties of drugs and dosage forms), pharmacology (effects of drugs on the body), pharmacognosy (drugs derived from plant or animal sources), hospital pharmacy, clinical pharmacy, and pharmacy administration. Clinical pharmacy is the synthesis of basic and pharmaceutical science education and the application of this knowledge to drug management problems in the care of patients. Courses in pharmacy administration are particularly helpful to pharmacists who become executives or managers.

All colleges of pharmacy offer courses in pharmacy practice, designed to teach students the skills involved in compounding and dispensing prescriptions, and to strengthen their understanding of professional ethics and responsibilities. In many cases, professional training increasingly emphasizes direct patient care as well as consultative services to other health professionals.

A limited number of Federal scholarships and loans are available for students studying full time toward a degree in pharmacy. In addition, scholarships are awarded annually by drug manufacturers, chain drugstores, corporations, State and national pharmacy associations, colleges of pharmacy, and other organizations.

Since many pharmacists are self-employed, prospective pharmacists interested in this type of practice should have business sense and the ability to gain the confidence of clients. Honesty, integrity, orderliness, and accuracy are important attributes.

Pharmacists often begin as employees in community pharmacies. After they gain experience and secure the necessary capital, they may become owners or part owners of pharmacies. A pharmacist with experience in a chain drugstore may advance to a managerial position, and later to a higher executive position within the company. Hospital pharmacists who have the necessary training and experience may advance to director of pharmacy service or to other administrative positions. Pharmacists in industry often have opportunities for advancement in management, sales, research, quality control, advertising, production, packaging, and other areas.

Some individuals put their pharmaceutical training to work in related fields. For example, pharmacists are hired as sales or medical service representatives by drug manufacturers and wholesalers. They sell medicines to retail pharmacies and to hospitals and inform health personnel about new drugs. Some teach in colleges of pharmacy, supervise the manufacture of pharmaceuticals, or are involved in research and the development of new medicines. Pharmacists also edit or write technical articles for pharmaceutical journals. Some combine pharmaceutical and legal training in jobs as patent lawyers or consultants on pharmaceutical and drug laws.

## Job Outlook

Employment of pharmacists is expected to grow about as fast as the average for all occupations through the 1980's. The employment outlook for pharmacists is expected to

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be favorable, overall, but the anticipated surplus of pharmacy graduates in some localities seems likely to produce keen job competition in those places. Besides openings created by growth in the demand for pharmacists, many openings will result from the need to replace pharmacists who transfer to other types of work, retire, or die.

Demand for pharmacists will be stimulated by population growth and the aging of the population, which will cause pharmacies to open or expand in regions experiencing growth and in places where concentrations of older people are developing. Morever, community pharmacies are expected to hire more pharmacists because of a trend towards shorter working hours. The projected increase in the elderly population is especially important, for the elderly are relatively heavy users of medicine and drugs. Other factors likely to spur demand for pharmacists during the 1980's include scientific advances that have made a wider range of drug products available for preventive and therapeutic uses; the rising standard of health care; and the growth of public and private health insurance programs that provide payment for prescription drugs.

Employment of pharmacists in hospitals and other health facilities is expected to rise faster than in other work settings. Pharmacists with advanced training will be needed for college teaching and top administrative posts.

## Earnings

Salaries of pharmacists are generally influenced by the location, size, and type of employer, as well as the duties and responsibilities of the position. The average starting salary for pharmacists working in hospitals, medical schools, and medical centers was about $21,300 a year in 1981, according to a national survey conducted by the University of Texas Medical Branch; experienced pharmacists in these workplaces averaged about $27,200 a year. Pharmacists who do consulting work in addition to their primary job may have total earnings considerably higher than this. Experienced pharmacists, particularly owners or managers of pharmacies, often earn considerably more.

The minimum entrance salary in the Federal Government for a new graduate with a bachelor's degree from an approved pharmacy degree program was about $15,200 a year in 1981. However, most graduates qualified for a beginning salary of about $18,600 a year; those with 2 years of graduate work, about $22,500 a year. Pharmacists with additional years of experience may start at a higher salary. The average salary for all federally employed pharmacists was about $23,900 in 1980.

According to a survey conducted by the American Association of Colleges of Pharmacy, average annual salaries of full-time personnel in colleges of pharmacy during 1980 were as follows: Deans, about $48,500; assistant and associate deans, about $38,600; full professors, around $38,800; associate professors, around $30,700; and assistant professors, about $24,600.

With the proliferation of chain drugstores and the increasing difficulty of owning a pharmacy, some pharmacists have joined unions. The main unions organizing pharmacists are the United Food and Commercial Workers International Union and District 1199, an affiliate of the Retail, Wholesale and Department Store Union.

## Related Occupations

Pharmacists fill the prescriptions of physicians, dentists, and other health practitioners and are responsible for selecting, compounding, dispensing, and preserving drugs and medicines. Workers in other professions requiring similar educational training and who work with pharmaceutical compounds or perform related duties include pharmaceutical bacteriologists, pharmaceutical chemists, and pharmacologists.

## Sources of Additional Information

Additional information on pharmacy as a career, preprofessional and professional requirements, programs offered by colleges of pharmacy, and student financial aid is available from:

American Association of Colleges of Pharmacy, Office of Student Affairs, 4630 Montgomery Ave., Suite 201, Bethesda, Md. 20014.

General information on pharmacy is available from:

American Pharmaceutical Association, 2215 Constitution Ave. NW., Washington, D.C. 20037.

Information about chain drugstores is available from:

National Association of Chain Drug Stores, 413 N. Lee St., Alexandria, Va. 22314.

General information on retail pharmacies is available from:

National Association of Retail Druggists, 1750 K St. NW., Washington, D.C. 20006.

For a list of accredited colleges of pharmacy, contact:

American Council on Pharmaceutical Education, One East Wacker Dr., Chicago, Ill. 60601.

Information on requirements for licensure in a particular State is available from the Board of Pharmacy of that State or from:

National Association of Boards of Pharmacy, One East Wacker Dr., Suite 2210, Chicago, Ill. 60601.

Information on college entrance requirements, curriculums, and financial aid is available from the dean of any college of pharmacy.

# Physical Therapists

(D.O.T. 076.121-014)

## Nature of the Work

Physical therapists plan and administer treatment for patients referred by a physician in order to restore bodily functions, relieve pain, or prevent permanent disability following a disabling injury or disease. Their patients include accident victims, handicapped children, and stroke victims. Physical therapy also is used in the treatment of multiple sclerosis, cerebral palsy, nerve injuries, amputations, fractures, and arthritis.

Initially, physical therapists review and evaluate the patient's condition and medical records, perform tests or measurements, and interpret the findings. Then they develop a treatment plan in cooperation with the patient's physician. The goal is to help patients attain maximum muscle strength and motor skills but, at the same time, accept and adjust to the limiting effects of their disabilities. Patients often are suffering emotional as well as physical stress, and treatment requires sensitivity in addition to technical proficiency on the part of the therapist.

Since treatments may be prolonged, the full cooperation of the patient is very important. As a first step, therefore, physical therapists familiarize themselves with patients' personal backgrounds, as well as with their medical histories, and make an effort to gain their trust and confidence. The therapist-patient relationship can be highly important in determining the effectiveness of the treatment.

Therapeutic procedures include exercises for increasing strength, endurance, coordination, and range of motion; electrical stimulation to activate paralyzed muscles; instruction in carrying out everyday activities and in the use of helping devices; and the application of massage, heat, cold, light, water, or electricity to relieve pain or improve the condition of muscles and skin. To carry out these procedures, therapists must have detailed knowledge of human anatomy and physiology and know what steps may be taken to correct disease and injury.

Treatment can be more effective and progress faster if patients and their families understand the purpose and plan and know just how they can help. Physical therapy services include instructing patients and their families in how to carry on prescribed treatment programs at home. They may need specific instruction in the techniques of muscle contraction and relaxation or in the care and use of braces or prosthetic appliances. Physical therapists may personally conduct the treatment program or supervise a program conducted by a physical therapist assistant.

Physical therapists usually perform their own evaluations of patients; in some hospitals and nursing homes, however, the director or assistant director of the physical therapy department may handle this work, which requires extensive training and experience. Therapists may treat patients with a wide variety of problems, or they may specialize in pediatrics, geriatrics, orthopedics, sports medicine, neurology, or cardiopulmonary diseases.

## Working Conditions

Physical therapists generally work in pleasant surroundings. Evening and weekend

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hours may be required, especially for those in private practice who must be available at times convenient for their patients. The job can be physically exhausting. In addition to standing for long periods, therapists must move equipment and help patients turn, stand, or walk.

## Employment

About 34,000 physical therapists were employed in 1980. About half worked in hospitals. A substantial number provided physical therapy services in nursing homes—either as staff members or on a contract basis. Therapists also worked in rehabilitation centers, schools and residential facilities for handicapped children, home health agencies, outpatient clinics, and physicians' offices. Some taught, conducted research, or served as consultants. A number of physical therapists were in private practice.

## Training, Other Qualifications, and Advancement

All States, the District of Columbia, and the Commonwealth of Puerto Rico require a license to practice physical therapy. Applicants for a license must have a degree or certificate from an accredited physical therapy educational program and, to qualify, must pass a State licensure examination. Applicants may prepare for State licensure examinations in physical therapy through one of three types of programs, depending upon previous academic study. High school graduates can earn a 4-year bachelor's degree in physical therapy at a college or university. Students who already hold a bachelor's degree in another field, such as biology, can earn a second bachelor's degree, or a certificate, or an entry level master's degree in physical therapy.

In 1981, there were 7 certificate programs, 100 bachelor's degree programs, and 8 master's degree programs accredited to provide entry level training. There were also 16 other master's degree programs and 5 doctoral degree programs that provided advanced training to those already in the field. One of the master's degree programs is sponsored jointly by the U.S. Army and Baylor University; graduates are commissioned as officers in the Army.

The physical therapy curriculum includes science courses such as anatomy, physiology, neuroanatomy, and neurophysiology; it also includes specialized courses such as biomechanics of motion, human growth and development, and manifestations of disease and trauma. Besides receiving classroom instruction, students get supervised clinical experience administering physical therapy to patients in hospitals and other treatment centers.

Competition for entry to physical therapy programs is keen. Consequently, students seriously interested in attending a physical therapy program must attain superior grades in their earlier studies, especially in science courses. High school courses that are useful include health, biology, chemistry, social science, mathematics, and physics.

Personal traits that physical therapists need include patience, tact, resourcefulness, and emotional stability to help patients and their families understand the treatments and adjust to their handicaps. Physical therapists also should have manual dexterity and physical stamina. Many persons who want to determine whether they have the personal qualities needed for this occupation volunteer for summer or part-time work in the physical therapy department of a hospital or clinic.

A graduate degree combined with clinical experience increases opportunities for advancement, especially to teaching, research, and administrative positions.

Physical therapist helps patient exercise leg.

## Job Outlook

Employment of physical therapists is expected to grow much faster than the average for all occupations through the 1980's because of increased public support for rehabilitation services. Many new positions for physical therapists will be created as programs to aid disabled persons expand, and as nursing homes and other long-term care facilities attempt to provide residents with more adequate therapy and rehabilitation services.

The aging of the population will spur demand for physical therapists and other rehabilitation personnel in hospitals, nursing homes, and home health agencies. The number of people who need therapy will increase sharply: Very rapid growth is projected for the population age 75 and above, an age group that suffers a relatively high incidence of disabling accidents and illnesses. Howev-

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er, the degree to which population growth is translated into new jobs for physical therapists will depend upon other factors as well, including the extent to which health care providers encourage this level of care for elderly patients, and the availability of funds to pay for it.

Job prospects in physical therapy should continue to be excellent. New graduates are in great demand, and although enrollments are rising, the number of people completing training programs during the 1980's is expected to fall short of demand. In addition to the jobs created by increased demand for therapists, many openings will result from replacement needs. Many part-time positions will be available.

### Earnings

Starting salaries for new physical therapy graduates averaged about $17,000 a year in 1981, according to a national survey conducted by the University of Texas Medical Branch. Earnings of experienced physical therapists averaged about $21,600, with some earning nearly $27,000 a year.

Beginning therapists employed by the Veterans Administration (VA) earned starting salaries of $13,700 a year in 1981. The average salary paid therapists employed by the VA in 1980 was about $19,600 annually; supervisory therapists may earn more than $24,000.

### Related Occupations

Physical therapists are concerned with the treatment and rehabilitation of persons with physical or mental disabilities or disorders. They may use exercise, massage, heat, water, electricity, and various therapeutic devices to help their patients gain independence. Others who do similar work include occupational therapists, speech pathologists and audiologists, orthotists, prosthetists, and respiratory therapists.

### Sources of Additional Information

Additional information on a career as a physical therapist and a list of accredited educational programs in physical therapy are available from:

American Physical Therapy Association, 1156 15th St. NW., Washington, D.C. 20005.

## Physician Assistants

(D.O.T. 079.364-018)

### Nature of the Work

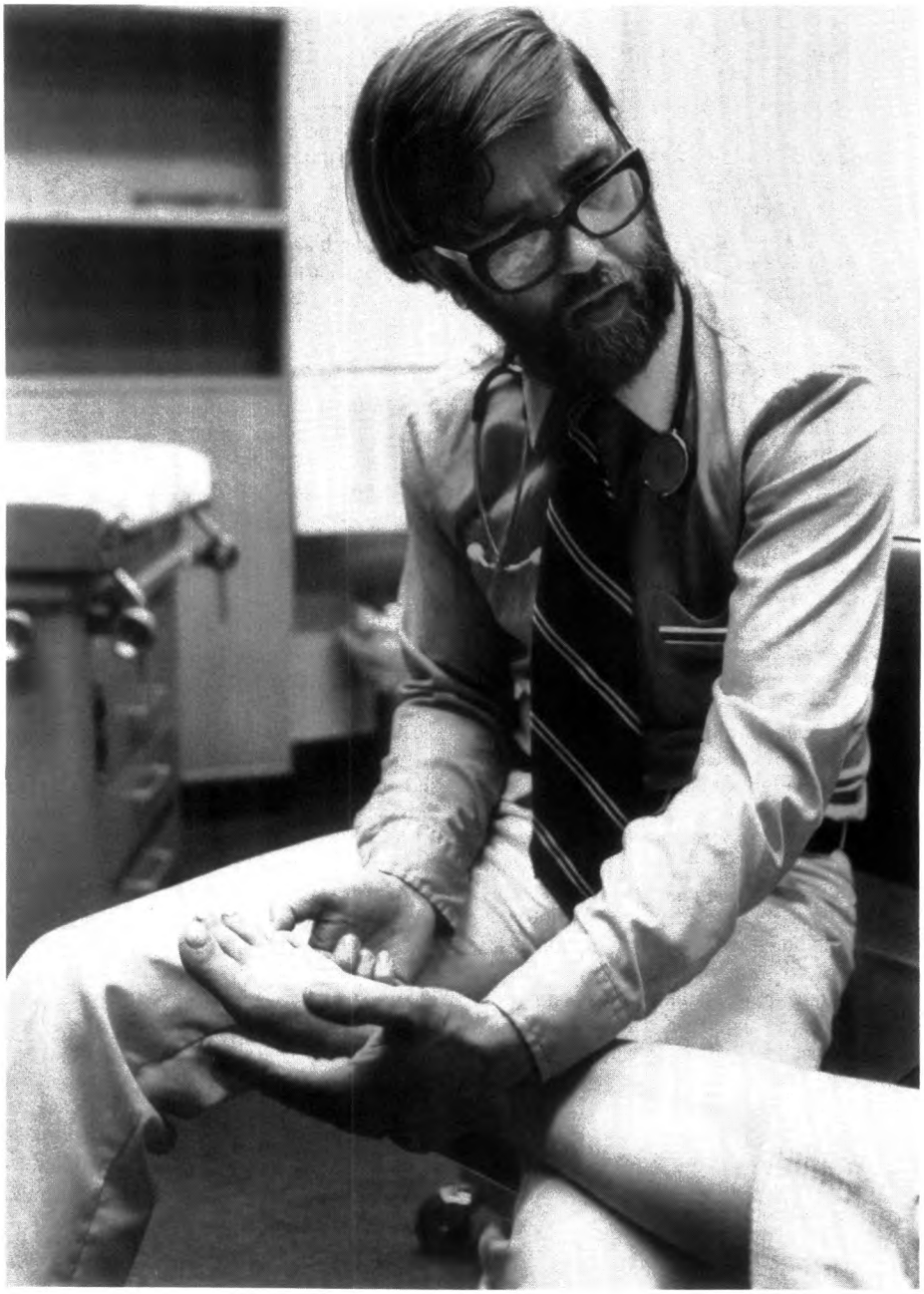
The occupation of physician assistant (PA) came into being during the 1960's, when physicians were in short supply. The idea was to use the large number of medical corpsmen trained during the Vietnam conflict to ease the medical shortage. Additional training enabled these ex-medics and other people who had extensive patient-care experience, such as nurses, to become PA's. With skills similar to—though less extensive than—those of a physician, PA's can perform many time-consuming tasks normally done by physicians. They interview patients, take medical histories, perform physical examinations, order laboratory tests, make tentative diagnoses, and prescribe appropriate treatments. Studies show they have the training to care for 8 out of 10 people who visit a family practitioner's office in any one day. Physician assistants, however, must always work under the direction of a licensed, "supervising physician."

Alternate titles sometimes used by these workers are MEDEX, physician associate, and community health medic. Some PA's assist physicians in such specialty areas as pediatrics or surgery. They perform routine procedures such as physical examinations, provide postoperative care, and assist during complicated medical procedures such as cardiac catheterizations. These specialist PA's include *child health associates*, *orthopedic physician assistants*, *urologic physician assistants*, *surgeon assistants*, and *emergency room physician assistants*.

### Working Conditions

Physician assistants work in the same places as physicians. Hospitals, clinics, and physicians' offices usually provide a comfortable, well-lighted environment, although PA's must often stand for long periods and do considerable walking.

The workweek and schedule vary according to the setting. Some emergency room PA's work 24-hour shifts twice weekly and others work three 12-hour shifts each week. The workweek of PA's who work in physi-



Physician assistants treat common injuries and ailments.

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cians' offices may include some night office hours or early morning hospital rounds visiting patients. PA's in clinics usually work a 5-day, 40-hour week.

## Employment

An estimated 9,500 physician assistants were employed in 1980. Most PA's work for physicians who are in private practice. About 25 percent are employed by hospitals, including those of the Veterans Administration and Public Health Service. A small but growing number of PA's work for prepaid health plans or clinics.

Despite efforts to encourage physicians to practice where they are needed most, many rural areas and inner cities remain underserved. Almost 20 percent of all Americans live in counties with a population less than 50,000, yet only 8 percent of all active physicians are located in these areas. PA's provide crucial health care services in these areas; more than 40 percent of all PA's practice in them.

Although most PA's in medically underserved areas are associated with physicians in private practice, some work in clinics, where a physician might be available just 1 or 2 days each week. For the balance of the week, a PA working with one or more nurses, technicians, or medical assistants provides all health care services. PA's in these clinics usually have quick telephone access to a physician for consultation, but experience has shown that normally few consultations are needed. The Rural Health Clinics Service Act of 1977 helped promote this type of practice by making reimbursement by Medicare easier; currently, over 10 percent of all PA's practice in one of these clinics.

## Training, Other Qualifications, and Advancement

In 1980, 64 educational programs for primary care physician assistants or surgeon assistants were approved by the Committee on Allied Health Education and Accreditation of the American Medical Association.

Admission requirements to these programs vary from a high school diploma to a bachelor's degree, but 60 credit hours—2 years—of college work in a science or health professions program is common. Entry is very competitive; many applicants already hold a bachelor's or master's degree. Currently, 80 percent of the students in PA programs had extensive experience in health care before they started their studies. Many programs consider such experience, in jobs ranging from medical technician to nursing aide, an important requirement for admission. Still, lack of experience need not be a barrier to applicants who are otherwise qualified.

Training programs are generally 2 years in length, although some are longer and a few that require prior health-related training are shorter. These programs are located in medical schools and in community colleges, 4-year colleges, and universities affiliated with accredited teaching hospitals. PA training begins with a classroom or preclinical phase that lasts 9 to 12 months. Classroom instruction includes anatomy, physiology, chemistry, medical terminology, human behavior, pharmacology, clinical medicine, radiology, microbiology, and pathology. Students then spend about a year doing clinical work in a series of clinical rotations. Some of the rotations—or medical specialties—include family practice, inpatient medicine, general surgery, obstetrics and gynecology, emergency medicine, internal medicine, psychiatry, and pediatrics. Often, one or more of the rotations are served under the "preceptorship" or supervision of a physician who is seeking to hire a PA. This trial employment often leads to a permanent position.

Most PA programs award graduates a certificate attesting to their training. Some programs award an associate of arts degree, and the 20 or so that require extensive college work prior to admission award a bachelor's or master's degree to graduates. Often, students may apply their PA course work toward satisfying the requirements for a bachelor's degree.

The MEDEX training program is a slight variation of the PA program. MEDEX programs are designed especially for trainees who have had extensive, direct patient care experience, usually in roles such as medical corpsman or registered nurse. This extensive background allows for a shorter period of classroom training and increased emphasis on clinical experience. MEDEX students usually gain most of this clinical experience working with the supervising physician who will hire them upon graduation. MEDEX programs are slightly shorter than other PA programs, lasting about 18 months.

The activities of PA's are regulated in nearly every State, but the requirements vary widely. Some States require that PA's be formally trained or certified by the National Commission on Certification of Physician Assistants, Inc. (NCCPA). Most States also require PA's to register with the State medical board or a similar agency. Because there is so much variation, however, aspiring PA's should review the laws in those States where they wish to practice. Thirty-five States require PA's to be certified. In 1980, about 8,000 or 85 percent of them had gained certification. Applicants may qualify to take the certification to examination in 1 of 3 ways. By far the most common way is to graduate from an approved PA training program. The second way, available only to registered nurses, is to complete an approved pediatric or family nurse practitioner program. Third, applicants may qualify if they have a high school diploma (or a general equivalency certificate) and have worked full-time for the past 4 years in a clinical setting as a physician assistant or nurse practitioner, and their employer can verify to the NCCPA that the work experience included all of the essential health care functions of a physician assistant. The certification examination itself consists of an all-day written test and a practical component to assess the candidates' skills in conducting a physical examination.

Individuals planning a career as a physician assistant should be conscientious and willing to study a great deal throughout their career in order to keep up with medical advances. They should exhibit leadership, self-confidence, and emotional stability. A pleasant personality, patience, and the ability to deal with all kinds of people are also helpful.

Formal lines of advancement have not evolved within this young profession. There are no head PA's in hospitals or nursing homes as there are head nurses; by the very nature of the profession, individual PA's are supervised by physicians. Since a supervising physician shares responsibility for the quality of care rendered by the PA, this relationship must be a close one, and a middle level of supervision would be an interference.

For most PA's, advancement takes the form of the added responsibilities and higher earnings that come with experience and, sometimes, with completion of continuing education courses.

## Job Outlook

A recent survey revealed that very few PA's in search of a position were unable to find one. New graduates may have had to accept jobs in medically underserved areas, but they did not necessarily view this as a hardship. Over half of the students in training programs said they would prefer to practice in a small city or town.

Long-term employment prospects for PA's are more difficult to assess. The occupation, though still very small, has experienced extraordinary growth: The number of PA's increased from fewer than 100 in 1970 to about 9,500 in 1980. The extent of future growth in the occupation remains uncertain because of a number of unresolved issues in the area of health policy.

Restrictions on reimbursement for the services of PA's is one of the most important questions clouding the profession's future. Studies have established that substituting PA's for some physicians can lower payroll costs without reducing the quality of care. However, the majority of health insurance plans—including Medicare and Medicaid, in most cases—do not provide for reimbursement of services performed solely by a PA. This uncertainty regarding payment makes many hospitals and physicians reluctant to hire PA's.

Another unsettling factor is the diversity of State laws that regulate the kinds of services PA's may perform. In some States, they have the authority to make medical decisions and prescribe treatment. In others, they are allowed to practice only under the immediate supervision of a physician. Most States restrict PA prescribing to a limited number of drugs. Some prohibit PA's from writing prescriptions. Furthermore, many of these laws are under review in the State legislatures, and employers may be reluctant to hire PA's

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without knowing what rules will govern their use in coming years.

The supply of physicians also may affect future prospects for PA's. In the early 1960's, the Federal Government launched a series of programs designed to expand the number of graduates from U.S. medical schools. There is some concern now that the job may have been accomplished too well. A study released in 1980 by the Graduate Medical Education National Advisory Committee warned of a probable oversupply of physicians by 1990. Barring a major increase in demand, such as might result from passage of a national health insurance program, the increased number of physicians could lead to lower patient loads for physicians, and demand for PA's could decline.

An oversupply of physicians might also lead more doctors to locate in the medically underserved areas where PA's now tend to locate. A dispersal of physicians to more remote areas could displace PA's and lower the demand for their services.

However, sparsely populated areas probably will always have trouble attracting full-time physicians, and PA services in these areas will remain an important contribution to health care.

Some developments could heighten rather than curtail demand for PA's. An increase in the number of prepaid health plans, such as health maintenance organizations (HMO's), holds some promise for future PA employment. These plans provide complete health care services to members for a set annual charge. Many of these plans are attempting to cut costs by substituting physician assistants for some physicians. Because the plan collects payment directly from the client, the problem of collecting fees from insurance plans is avoided. The use of PA's in these prepaid health programs should provide many employment opportunities in cities.

The increase in the population over 65 could also have a favorable impact on the employment of PA's. Compared to younger people, the elderly visit physicians more often, spend more money on medicine and drugs, and spend much more on hospital stays. Resolution of the reimbursement issue could lead to greater employment of PA's by nursing homes and home health care agencies that serve the elderly.

Also affecting the outlook for PA's are enrollments in PA training programs. In recent years, enrollments have leveled off. The Graduate Medical Education National Advisory Committee recommended that PA training continue at current levels (about 1,500 in 1980).

## Earnings

In 1981, physician assistants just starting work in hospitals and medical centers earned about $18,000 on the average, according to a national survey conducted by the University of Texas Medical Branch. Typically, the highest pay for PA's in these settings was about $22,000, although some earned as much as $32,000.

The average salary of PA's in all settings was about $19,000 in 1980. PA's in health maintenance organizations, hospitals, and physicians' offices earn slightly more than those in clinics.

Veterans Administration hospitals started PA's at the GS-8 level, or about $16,800 a year in 1980. Advancement to GS-12 is possible. Average earnings for all PA's employed in VA hospitals were about $24,000.

## Related Occupations

Other health workers who provide patient care that requires a similar level of skill and training include nurse practitioners, physical therapists, and occupational therapists.

## Sources of Additional Information

For more information about the profession, send for the brochure, "The PA Profession, What You Should Know," available free from:

Association of Physician Assistant Programs, 2341 Jefferson Davis Hwy., Suite 700, Arlington, Va. 22202.

Information on individual PA training programs also is available from the Association. The 1981-82 edition of its publication entitled *Profile* contains a list of educational programs and a description of each program complete with accreditation status, admission procedures and requirements, and cost. Information on certification requirements is also given. *Profile* may be ordered from the Association for $10 prepaid.

For a description of the national certifying examination for primary care physician assistants and eligibility requirements, write to:

National Commission on Certification of Physician Assistants, Inc., 3384 Peachtree Rd. NE., Suite 560, Atlanta, Ga. 30326.

# Registered Nurses

(D.O.T. 075.117 through .374)

## Nature of the Work

Registered nurses (R.N.'s) perform a wide variety of health care functions. They observe, assess, and record symptoms, reactions, and progress of patients; administer medications; assist in the rehabilitation of patients; instruct patients and family members in proper health maintenance care; and help maintain a physical and emotional environment that promotes recovery. Some R.N.'s administer community health programs, conduct research, or teach. The setting usually determines the scope of the nurse's responsibilities.

- *Hospital nurses* constitute by far the largest group of nurses. Most are staff nurses who provide skilled bedside nursing care and carry out the medical regimen prescribed by physicians. They may also supervise licensed practical nurses, aides, and orderlies. Hospital nurses usually work with groups of patients who require similar nursing care. For instance, some nurses work with patients who have had surgery; others care for children, the elderly, or the mentally ill.

  Registered nurses working in nursing homes provide bedside nursing care to patients convalescing from surgery or an illness, and to those suffering from chronic illnesses and disabilities. They also supervise licensed practical nurses and nursing aides.
- *Private duty nurses* give individual care to patients who need constant attention. They may work in a home, a hospital, or a convalescent institution.
- *Community health nurses* care for patients in clinics, homes, schools, and other community settings. They instruct patients and families in health care and give periodic care as prescribed by a physician. They also may instruct community groups in proper diet and arrange for immunizations. These nurses work with community leaders, teachers, parents, and physicians in community health education. Some community health nurses work in schools.
- *Office nurses* assist physicians, dental surgeons, and occasionally dentists in private practice or clinics. Sometimes they perform routine laboratory and office work in addition to their nursing duties.
- *Occupational health or industrial nurses* provide nursing care to employees in industry and government and, along with physicians, promote employee health. As prescribed by a doctor, they treat minor injuries and illnesses occurring at the place of employment, provide for the needed nursing care, arrange for further medical care if necessary, and offer health counseling. They also may assist with health examinations and inoculations.
- *Nurse educators* teach students the principles and skills of nursing, both in the classroom and in direct patient care. They also conduct continuing education courses for registered nurses, practical nurses, and nursing assistants.

## Working Conditions

Nurses generally work indoors in well-lighted, comfortable buildings. Community health nurses may be required to travel to patients in all types of weather. Although most nursing tasks are not strenuous, nurses need physical stamina because they spend considerable time walking and standing. Emotional stability is required in order to cope with human suffering and frequent emergencies. Because patients in hospitals and nursing homes require nursing care at all times, staff nurses in these institutions may be required to work nights and weekends.

## Employment

About 1,105,000 registered nurses were employed in 1980. About one-third worked part time.

Two out of three registered nurses work in hospitals. The remainder use their nursing skills in a variety of settings. Nursing homes employed about 86,000 registered nurses in

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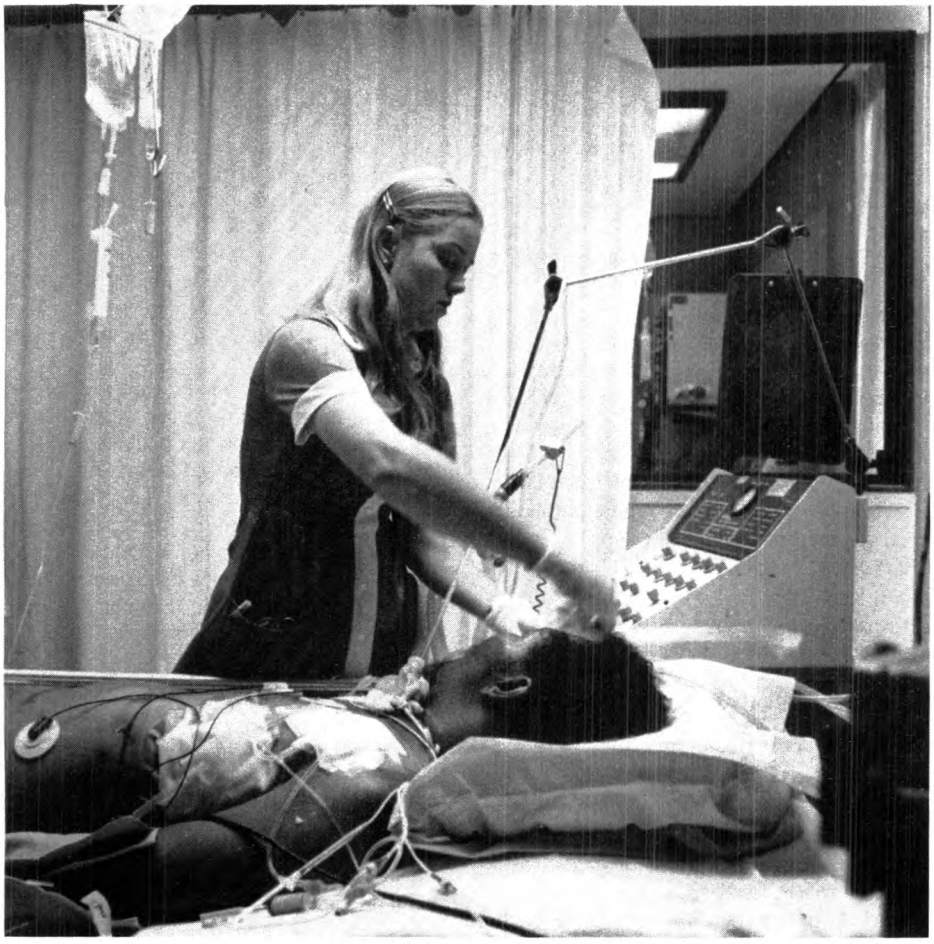

Nurse in hospital intensive care unit monitors patient.

1980, and the offices of doctors, dentists, and other health practitioners accounted for over 70,000. There were nearly 63,000 community health nurses, employed primarily in public health departments, home health agencies, and visting nurse associations. Approximately 40,000 R.N.'s were school nurses, and 25,000 worked as occupational health nurses in business and industry. About 30,000 were private duty nurses.

Quite a few nurses hold positions in education, research, or administration that involve little if any direct patient care. Such positions require experience, advanced training, or both. About 38,000 nurse educators taught in schools of nursing in 1980, and many other nurses were staff members of health organizations, consulting firms, or research organizations. Some worked for State boards of nursing.

## Training, Other Qualifications, and Advancement

A license to practice nursing is required in all States and in the District of Columbia. To obtain a license, an applicant must be a graduate of a State-approved school of nursing and pass the State board examination. Nurses may be licensed in more than one State, either by examination or endorsement of a license issued by another State.

There are three types of nurse training programs—2-year associate degree programs, 3-year diploma programs, and 4- or 5-year bachelor's degree programs. Associate degree programs are offered in community and junior colleges; diploma programs, by hospitals and independent schools; and bachelor's degree programs, in colleges and universities. Several associate degree programs provide practical nurses with the training necessary to qualify for licensure as registered nurses while they continue to work part time.

Graduation from high school is required for admission to all schools of nursing. In 1980, about 1,403 nurse training programs were offered in the United States. In addition, there were about 127 master's degree and several doctoral degree programs providing advanced education in nursing.

Individuals considering a career in nursing should bear in mind that the kind of program they choose—associate, diploma, or bachelor's degree—affects the opportunities that will be open to them in the future. For supervisory or administrative positions, for jobs in public health agencies, and for admission to graduate nursing programs, for example, a bachelor's degree in nursing is necessary. Those considering research, consulting, teaching, or a clinical specialization also should start their nursing education in a bachelor's program. To move from one type of program to another is possible but can be costly and time consuming.

All nurse training programs include classroom instruction and supervised nursing practice in hospitals and other health facilities. Students take courses in anatomy, physiology, microbiology, nutrition, psychology, and nursing. They also get supervised clinical experience in the care of patients who have different types of health problems. Students in bachelor's degree programs as well as in some of the other programs are assigned to community agencies to learn how to care for patients in clinics and in the patients' homes. Varying amounts of general education are combined with nursing education in all three types of programs.

Students who need financial aid may qualify for federally sponsored nursing scholarships or low-interest loans. Those who want to pursue a nursing career should have a sincere desire to serve humanity and be sympathetic to the needs of others. Nurses must be able to accept responsibility and direct or supervise the activity of others; they must have initiative, and in appropriate situations be able to follow orders precisely or determine if additional consultation is required; and they must use good judgment in emergencies.

From staff positions in hospitals, experienced nurses may be promoted to the position of head nurse, assistant director, and eventually, director of nursing services. For nurses who prefer close contact with patients, career advancement may take the form of clinical specialization or training to become a nurse practitioner. Both of these options require graduate education. Clinical specialization, for example, requires completion of a master's degree program. Gerontological nurses are clinical specialists who provide full nursing care to elderly patients in whatever setting they are found. Other areas of specialization include pediatrics and maternity.

At least 45 postbachelor's degree programs prepare R.N.'s for independent roles as nurse practitioners. As nurse practitioners, they can perform physical examinations and use diagnostic and health assessment skills beyond those of regular nurses. Areas of practice include: Pediatrics, geriatrics, community health, mental health, midwifery, and medical-surgical nursing.

Both clinical specialists and nurse practitioners can seek certification of their advanced status in nursing. The American Nurses' Association grants certification to those who meet requirements for advanced training and experience and pass the certification examination.

## Job Outlook

Employment opportunities for registered nurses will continue to be favorable through the 1980's. In addition to the need to fill new positions, large numbers of nurses will be required to replace those who leave the field each year.

Opportunities for both full-time and part-time work are very good at present; there is a

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widespread shortage of nurses. However, the supply of R.N.'s is expected to increase during the 1980's as a result of the expansion of training programs that occurred in the 1970's. The current shortage is expected to abate, provided employers offer sufficiently attractive wages and working conditions. Even so, shortages of R.N.'s are likely to persist in some areas—rural areas and big city hospitals in particular. But some competition is expected for the more desirable, higher paying jobs, especially in areas considered highly attractive because of climate, local recreational facilities, or natural beauty, and in areas where training programs abound. Nurses with a bachelor's degree should have the best prospects in these areas. For nurses who have had graduate education, the outlook is excellent for obtaining positions as administrators, teachers, clinical specialists, and community health nurses.

Employment of registered nurses is expected to increase faster than the average for all occupations because of population growth and the aging of the population. Other factors that will stimulate demand for nurses include: Widespread availability of public and private health insurance; broader access to health care as a result of growing emphasis on noninstitutional care; and increased interest in preventive medicine and rehabilitation of the handicapped.

## Earnings

Staff nurses in non-Federal hospitals had average earnings of $17,000 a year in 1980. This was above the average for nonsupervisory workers in private industry, except farming. Registered nurses working in nursing homes had average earnings of about $14,500. Industrial nurses averaged $17,000 a year in mid-1980, according to a survey conducted by the Bureau of Labor Statistics.

In 1981, the Veterans Administration paid inexperienced nurses who had a diploma or an associate degree the starting salary of $13,672 a year; those with a bachelor's degree, $15,993. Nurses employed in all Federal Government agencies earned an average of $19,690 in 1980.

Most hospital and nursing home nurses receive extra pay for work on evening or night shifts. Nearly all receive from 5 to 13 paid holidays a year, at least 2 weeks of paid vacation after 1 year of employment, and also some type of health and retirement benefits.

## Related Occupations

Other occupations with responsibilities and duties similar to registered nurses include: Occupational therapists, paramedics, physical therapists, physician assistants, and respiratory therapists.

## Sources of Additional Information

The National League for Nursing (NLN) publishes a variety of materials about nursing and nursing education, including a list of approved schools of nursing and information on student financial aid. One booklet describes master's degree programs to prepare nurse practitioners, clinical specialists, and nurse educators. For a complete list of NLN publications, write for a career information booklet. Send your request to:

Career Information Services, National League for Nursing, 10 Columbus Circle, New York, N.Y. 10009.

# Respiratory Therapy Workers

(D.O.T. 079.361)

## Nature of the Work

Respiratory therapy workers, sometimes called inhalation therapy workers, treat patients with cardiorespiratory problems. Treatment may range from giving temporary relief to patients with chronic asthma or emphysema to giving emergency care in cases of heart failure, stroke, drowning, or shock. Respiratory therapy workers are among the first medical specialists called for emergency treatment of acute respiratory conditions arising from head injury or drug poisoning. The therapy worker's role is a highly responsible one because if a patient stops breathing for longer than 3 to 5 minutes, there is little chance of recovery without serious brain damage, and if oxygen is cut off for more than 9 minutes, death results.

Following doctors' orders, respiratory therapy workers use special equipment, such as respirators and positive-pressure breathing machines, to treat patients who need temporary or emergency respiratory assistance. For example, they use aerosol inhalants to administer medication so that it is confined to the lungs. They often treat patients who have undergone surgery. The anesthesia administered during surgery depresses respiration, so respiratory therapy is prescribed to restore full, deep breathing and protect the patient against respiratory illness that could complicate recovery. They also show patients and their families how to use equipment at home. Other duties include keeping records of the cost of materials and charges to patients, and maintaining and making minor repairs to equipment.

There are three levels of workers within the field of respiratory therapy: Therapists, technicians, and assistants. Therapists and technicians perform essentially the same duties. However, the therapist is expected to have a higher level of expertise and may be expected to assume some teaching and supervisory duties. Respiratory assistants have little contact with patients and spend most of their time taking care of the equipment, including cleaning, sterilizing, and storing it. Many are new to the job and are training to advance to the technician or therapist level.

## Working Conditions

Respiratory therapy workers generally work a 40-hour week. Because many hospitals operate around the clock, they may be required to work evenings or weekends. Respiratory therapy workers spend long periods standing and, in an emergency, may work under a great deal of stress. The inhalants they work with are highly flammable; however, adherence to safety precautions and regular testing of equipment minimize the danger of fire.

## Employment

An estimated 50,000 persons worked as respiratory therapists, technicians, or assistants in 1980. Most worked in hospitals in respiratory therapy, anesthesiology, or pulmonary medicine departments. Others worked for oxygen equipment rental companies, ambulance services, and nursing homes.

## Training, Other Qualifications, and Advancement

Respiratory apparatus has become increasingly complex in recent years and, although many respiratory therapy workers are trained on the job, formal training now is stressed for entry to the field.

In 1980, nearly 400 institutions offered programs in respiratory therapy that were approved by the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association. High school graduation is required for entry to these programs. Courses for therapists range from 21 months to 4 years and include both theory and clinical work. A bachelor's degree is awarded for completion of a 4-year program and an associate degree for shorter courses. Technician courses usually last about 1 year and graduates are awarded certificates. Areas of study for both types of programs include human anatomy and physiology, chemistry, physics, microbiology, and mathematics. Technical courses deal with procedures, equipment, and clinical tests.

Respiratory therapists who have a certificate of completion from a CAHEA-approved therapist training program, 62 semester hours of college credit, and 1 year of experience following completion of the program are eligible to apply for registration by the National Board for Respiratory Therapy (NBRT). The registry examination consists of written and clinical simulation tests. Applicants must pass both to be awarded the Registered Respiratory Therapist (RRT) credential. In 1980, about 11,000 therapists had been registered.

Individuals who complete a CAHEA-approved technician training program and have 1 year of experience in respiratory therapy may apply to the NBRT for examination for the Certified Respiratory Therapy Technician (CRTT) credential. The CRTT examination is less comprehensive than the registry examination and consists of a single written test. Approximately 28,000 respiratory technicians had been certified in 1980.

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In contrast to therapists and technicians, there are no standard hiring requirements for the position of respiratory assistant. Requirements are set by the head of the hospital department that is hiring workers. For example, some may require only a high school diploma.

People who want to enter the respiratory therapy field should enjoy working with people and should be sensitive to patients' physical and psychological needs. Respiratory therapy workers must be able to pay attention to detail, follow instructions, and work as part of a team. Operating the complicated respiratory therapy equipment requires mechanical ability and manual dexterity. High school students interested in a career in this field are encouraged to take courses in health, biology, mathematics, physics, and bookkeeping.

Respiratory therapists can advance to assistant chief, chief therapist, or, with graduate education, to instructor of respiratory therapy at the college level. Respiratory technicians and assistants can advance to the therapist level by taking the appropriate training courses.

## Job Outlook

Employment of respiratory therapy workers is expected to grow much faster than the average for all occupations through the 1980's as a result of population growth, greater health consciousness, and widespread accessibility of hospital and surgical care through public and private health insurance. Demand for these workers also should increase due to the rising proportion of older persons.

The rate of surgery increased during the 1970's, with the most pronounced increase in operations occurring among persons 65 years of age and older, the segment of the population with the greatest frequency of heart and lung problems. The increase in surgery among the elderly may result in part from technological advances that make surgical procedures safer and more effective than they used to be, so that potential benefits to the elderly patient outweigh the risks. If this trend continues, demand for respiratory therapy workers will be heightened.

Additional openings will arise from the need to replace those individuals who transfer, retire, or die.

Employment prospects should be excellent for graduates of formal training programs. If the number of these graduates continues to rise, those without this training may face some competition.

## Earnings

The starting salary of respiratory therapists employed in hospitals averaged about $14,200 a year in 1981, according to a survey conducted by the University of Texas Medical Branch. Experienced respiratory therapists in hospitals earned an average salary of $18,100 a year in 1981. Salaries of respiratory technicians and assistants are lower than those of respiratory therapists.

The Federal Government paid respiratory therapists starting salaries of about $9,800 a year in early 1981 if they had 1 year of CAHEA-accredited postsecondary school training, and about $11,000 for those with 2 years of CAHEA-accredited training.

Respiratory therapy workers in hospitals receive the same benefits as other hospital personnel, including hospitalization, paid vacations, and sick leave. Some institutions provide tuition assistance or free courses, pension programs, uniforms, and parking.

Respiratory therapists are among the first specialists called for emergency treatment of breathing problems.

## Related Occupations

Respiratory therapy workers administer respiratory therapy care and life support to patients with heart and lung difficulties under the supervision of a physician. Other workers who care for, treat, or train people to improve their physical well-being include: Dialysis technicians, emergency medical technicians, licensed practical nurses, registered nurses, occupational therapists, and physical therapists.

## Sources of Additional Information

Information concerning education programs is available from:

American Association for Respiratory Therapy, 1720 Regal Row, Suite 112, Dallas, Tex. 75235.

Information on the certification of respiratory therapists and respiratory technicians can be obtained from:

The National Board for Respiratory Therapy, Inc., 11015 West 75th Terrace, Shawnee Mission, Kan. 66214.

A list of accredited and non-accredited postsecondary programs in respiratory therapy, arranged by State, may be found in *Programs and Schools, A supplement to the Directory of Postsecondary Schools with Occupational Programs, 1978,* a publication of the U.S. Department of Education's National Center for Education Statistics. This publication and similar directories put out by commercial publishers may be available in counseling centers or large public libraries.

Local hospitals can provide information on openings and training opportunities.

# Speech Pathologists and Audiologists

(D.O.T. 076.101 and .107)

## Nature of the Work

One American in ten is unable to speak or hear clearly. When left uncorrected, speech and hearing impairments are serious handicaps that can cause trouble throughout life. Children who have difficulty speaking or hearing cannot participate fully with other children in play or in ordinary classroom activities. Sometimes these children seem to have mental or emotional problems, when in fact the problem is hearing. Adults with speech or hearing impairments may have adjustment problems on the job. Speech pathologists and audiologists provide direct services to these people by evaluating their speech or hearing disorders and providing treatment.

The speech pathologist works with children and adults who have speech, language, and voice disorders resulting from causes such as total or partial hearing loss, brain injury, cleft palate, mental retardation, emotional problems, or foreign dialect. The au-

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diologist primarily assesses and treats hearing problems, sometimes by dispensing hearing aids. Speech and hearing, however, are so interrelated that, to be competent in one of these fields, one must be familiar with both.

The duties of speech pathologists and audiologists vary with education, experience, and place of employment. In clinics, such as those in schools and hospitals, they use diagnostic procedures to identify and evaluate speech and hearing disorders. Then, in cooperation with physicians, psychologists, physical therapists, and counselors, they develop and implement an organized program of therapy.

Speech pathologists and audiologists in colleges and universities teach courses in the principles of communication, communication disorders, and clinical techniques. Like other college faculty, they also have non-teaching activities. They do research and consult, and might, for example, plan and participate in educational programs in speech and hearing for physicians, nurses, and teachers. Some provide clinical services on campus.

Although most speech pathologists and audiologists do some administrative work, directors of speech and hearing clinics and coordinators of speech and hearing in schools, health departments, or government agencies may be totally involved in administration.

## Working Conditions

Many speech pathologists and audiologists work more than 40 hours a week. They generally work in clean, comfortable surroundings and spend most of their time at a desk or table. Although the job is not physically demanding, the close attention to detail and intense concentration needed can be mentally exhausting. These workers receive immense satisfaction from seeing their clients' speech and hearing improve, but a lack of progress can be very frustrating.

## Employment

About 35,000 persons worked as speech pathologists and audiologists in 1980. About half worked in public schools. Colleges and universities employed many in clinics and research centers. The rest worked in hospitals, speech and hearing centers, government agencies, industry, and private practice.

## Training, Other Qualifications, and Advancement

A master's degree in speech-language pathology or audiology is the standard credential in this field. Medicare and Medicaid, for example, only pay for speech pathology services provided by a practitioner with a master's degree. Furthermore, those working in public schools generally are required to have a practice certificate issued by the State educational agency. Certification requirements vary among the States, so individuals considering this type of setting should inquire about specific requirements in those States where they wish to locate. In 31 States, those offering speech pathology and audiology services in private practice, clinics, or other settings outside of schools must be licensed. Licensure requirements vary among the States.

Programs in speech pathology and audiology are offered at both the undergraduate and graduate levels. However, bachelor's degree programs usually are regarded as preprofessional. They prepare students to enter a graduate level program, or equip them for jobs as audiology technicians or aides. Undergraduate courses in speech pathology and audiology programs include anatomy, biology, physiology, physics, sociology, linguistics, semantics, and phonetics. Courses in speech and hearing as well as in child psychology and psychology of the exceptional child also are helpful. This training usually is available at colleges that offer a broad liberal arts program.

In 1980, about 230 colleges and universities offered master's or Ph.D. programs in speech pathology and audiology. Courses at the graduate level include advanced anatomy and physiology of the areas involved in hearing and speech; acoustics; psychological aspects of communication; and analysis of speech production, language abilities, and auditory processes. Graduate students also take courses in the evaluation and remediation of speech, language, and hearing disorders. All students at the graduate level receive supervised clinical training in communicative disorders.

Meeting the American Speech-Language-Hearing Association's (AS-L-HA) requirements for a Certificate of Clinical Competence (CCC) usually is necessary to advance professionally. To earn the CCC, a person must have a master's degree or its equivalent, complete a 1-year internship approved by the Association, and pass a national written examination.

Speech pathologists and audiologists should be able to approach problems objectively and have a concern for the needs of others. They also should have considerable patience, because a client's progress often is slow. A person who desires a career in speech pathology or audiology should be able to accept responsibility, work independently, and direct others. The ability to work with detail also is important.

## Job Outlook

Employment of speech pathologists and audiologists is expected to increase faster than the average for all other occupations through the 1980's. Population growth will add to the number of persons having speech and hearing problems. In addition, there is a trend toward earlier recognition and treatment of hearing and language problems in children. Many school-age children, thought to have learning disabilities, actually have language or hearing disorders that speech pathologists and audiologists can treat. Growth will be fastest during the early part of the decade as school systems increase their speech-language-hearing staffs to comply with the requirements of the Education for All Handicapped Children Act of 1975. After these goals are met, however, employment is expected to level off.

While school systems are expanding speech-language-hearing staffs to comply with the Handicapped Children's Act, employment opportunities for those with a master's degree generally should be favorable, but the large number of graduates entering this field will likely exceed openings during

Speech pathologists and audiologists test children in order to identify and evaluate speech and hearing disorders.

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the latter half of the decade. Although some jobs will be available for those having only a bachelor's degree, the preference shown by many employers for the master's degree will continue to limit opportunities at the bachelor's degree level. Many openings will occur outside of the large metropolitan areas, and graduates should take this into consideration when seeking employment. Competition for teaching positions in colleges and universities will be very strong throughout the period.

## Earnings

Audiologists in hospitals and medical centers had average starting salaries of about $17,000 a year in 1981, compared to about $17,400 for speech pathologists, according to a national survey conducted by the University of Texas Medical Branch. Experienced audiologists averaged $21,300 a year—about the same as speech pathologists.

The annual starting salary in the Federal Government for speech pathologists and audiologists with a master's degree was about $18,600 in early 1981. Those having a doctoral degree were eligible to start at about $22,500. The average salary of all speech pathologists and audiologists working for the Federal Government in 1980 was $27,200.

Many speech pathologists and audiologists, particularly those in colleges and universities, supplement their income by acting as consultants, doing research, and writing books and articles. Almost all receive benefits such as paid vacations, sick leave, and retirement programs.

## Related Occupations

Speech pathologists and audiologists specialize in the diagnosis and treatment of speech, language, and hearing problems. Workers in other professions who also perform rehabilitative functions include occupational therapists, optometrists, physical therapists, and some physicians and podiatrists.

## Sources of Additional Information

State departments of education can supply information on certification requirements for those who wish to work in public schools.

A list of accredited college and university graduate programs and a booklet on student financial aid as well as general career information are available from:

American Speech-Language-Hearing Association, 10801 Rockville Pike, Bethesda, Md. 20852.

The American Speech-Language-Hearing Association also issues a directory of accredited and nonaccredited graduate programs entitled *Guide to Graduate Education in Speech-Language Pathology and Audiology, 1980*. The *Guide* costs $8.

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# Health Technologists and Technicians

Many jobs in the health field owe their existence to the development of new laboratory procedures, diagnostic techniques, and life support systems. The sophisticated medical equipment in use today—computerized axial tomography (CAT) scanners, dialysis machines, and cardiac monitors—has created jobs for computerized tomographers, dialysis technicians, and cardiology technicians. Still other occupations will emerge as advances in the biomedical field occur.

Five of the statements in this section of the *Handbook* describe health careers that involve operating or monitoring biomedical equipment: Electrocardiograph technicians, electroencephalographic technologists and technicians, medical laboratory workers, radiologic technologists, and respiratory therapy workers. Dozens of other jobs have come into being with the introduction of new equipment.

*Radiologic (X-ray) technologists* operate the familiar X-ray machine. Some of them specialize. *Computerized tomographers*, for example, use equipment linked to a computer for cross-section X-rays of the brain or other parts of the body. *Mammographers* use X-ray techniques for breast examinations. *Diagnostic medical sonographers* use equipment which produces an image from sound waves reflected from the body to examine internal organs. *Electrocardiograph (EKG) technicians* operate equipment that monitors a patient's heart action. Many cardiac tests besides the EKG are in use today, and *cardiology technicians* of various kinds perform or assist with phonocardiograms, echocardiograms, stress tests, cardiac catheterizations, and other tests that enable physicians to detect heart problems. *Dialysis technicians*, who operate kidney machines, and *perfusionists*, who operate heart-lung machines, are examples of health workers who operate equipment on which patients' very lives depend.

Preparation for these careers varies. Some workers learn their skills on the job through several months of classroom and laboratory study combined with closely supervised clinical experience. As a rule, the newer the occupation, the more likely that training will be provided on the job. In most of these fields, however, workers obtain their training through formal programs, 1 or 2 years in length, that are offered by hospitals, community colleges, vocational-technical institutes, and universities. A few of these occupations require more extensive preparation. Training requirements for specific occupations are described in the statements that follow.

The distinction between a health *technologist* and a health *technician* lies in the complexity of the job. Technologists perform at a higher level of responsibility than technicians, and therefore need more training. The length of this training varies with the occupation. For example, *medical technologists*, who use laboratory techniques to test specimens of body fluids and tissues for evidence of disease, need a bachelor's degree with a specialization in medical technology, and *medical technicians* usually are graduates of 2-year programs. *Electroencephalographic (EEG) technologists*, who operate machinery that monitors the electrical activity of patients' brains, generally complete 1 or 2 year training programs, while training for *EEG technicians* lasts only about 6 months.

Some of the occupations discussed in this section of the *Handbook* reflect successful efforts to extend the services of highly skilled health practitioners by redesigning auxiliary jobs. The job of the *dental hygienist*, for example, has been expanded so that dentists can serve more patients without sacrificing the quality of care. Preparation for a career in dental hygiene requires completion of a formal 2-year program. The job of *emergency medical technician* illustrates another response to the need to provide health care in the absence of a practitioner. These workers are specially trained to provide medical attention when no physician or nurse is available—typically at the site of a fire, automobile accident, or other emergency.

Other health careers discussed in this section that require 1 or 2 years of specialized training after high school are *medical record technician*, *surgical technician*, and *licensed practical nurse*.

Practical nursing is by far the largest of these occupations. About 550,000 licensed practical nurses were employed in 1980. Other large occupations included medical laboratory workers (205,000), emergency medical technicians (120,000), and radiologic technologists (106,000.) Employment in the other occupations discussed in this section ranges from medical record technicians and clerks (55,000) to electroencephalographic technologists (5,000.)

Employment in the health industry is expected to grow much faster than the average for all industries through the 1980's due to population growth, especially the substantial increase in the number of older people. But the availability of public and private health insurance will continue to have a significant impact on the actual level of employment in the health industry and on the occupational mix as well. An increase in the number of persons covered by health insurance would generate greater demand for health services and an increase in employment. Moreover, health insurance terms that prescribe what kinds of health care are reimbursable also affect jobs. Thus, coverage for services provided in convalescent institutions and outpatient care facilities has contributed to employment growth in these areas of health care. More generous coverage for home health care services would stimulate demand for those services, thus altering the occupational mix of health care workers. While it is clear that health industry employment is affected by changes in funding levels and in the services for which funding is available, it is not clear what changes in health care financing are likely to occur during the 1980's. In addition to jobs created by growth in the health field, many new workers will be needed each year to replace workers who retire, die, or leave the occupations for other reasons.

Several other sections of the *Handbook* contain statements on health careers. Check the alphabetical index at the back to locate the statements on health services administrators, dental assistants, medical assistants, optometric assistants, occupational therapy assistants, physical therapy assistants, dispensing opticians, ophthalmic laboratory technicians, and dental laboratory technicians.

Books and brochures on health careers are available in libraries, counseling centers, and bookstores. The Sources of Additional Information section at the end of each *Handbook* statement identifies organizations that can provide pamphlets, lists of accredited schools, and sources of financial aid. For an overview of jobs in the health field, including some jobs not covered in the *Handbook*, request a copy of "200 Ways to a Health Career" from:

National Health Council, 1740 Broadway, New York, N.Y. 10019.

Another useful publication is *Health Careers Guidebook*, fourth edition, published in 1979 by the U.S. Department of Labor and the U.S. Department of Health, Education, and Welfare (now the Department of Health and Human Services.) It is available for $6.00 from:

Superintendent of Documents, U.S. Government Printing Office Washington, D.C. 20402.

## Dental Hygienists

(D.O.T. 078.361-010)

### Nature of the Work

Dental hygienists, working under the direction of a dentist, provide direct patient care; they remove deposits and stains from patients' teeth, expose and develop dental X-ray films, and perform various other preven-

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tive and therapeutic services. Helping the public develop and maintain good oral health is another important aspect of the job, and hygienists may instruct patients in the proper selection and use of toothbrushes and other devices, for example, or explain the relationship between diet or smoking and oral health.

Specific responsibilities of the hygienist vary, depending on the law of the State where the hygienist is employed, but may include removing scale from teeth; applying topical fluoride to prevent tooth decay; taking medical and dental histories; taking X-rays; making impressions of teeth for study models; and preparing other diagnostic aids. Pain control and restorative procedures may be performed by dental hygienists in some States.

Dental hygienists who work in school systems serve in several capacities. Clinical functions include examining children's teeth, assisting the dentist in determining the dental treatment needed, and reporting the findings to parents. They also scale and polish teeth and give oral hygiene instruction. In addition, they develop and deliver classroom and assembly programs on oral health.

A few dental hygienists assist in research projects. Those having advanced training may teach in schools of dental hygiene.

## Working Conditions

Dental hygienists usually work in clean, well-lighted offices. Important health safeguards for persons in this occupation are regular medical checkups and strict adherence to established procedures for using X-ray equipment.

Dental hygienists employed full time in private offices usually work between 35 and 40 hours a week. They may work on Saturdays or during evening hours. Some hygienists work for two dentists or more.

Dental hygienists clean and scale teeth.

## Employment

About 36,000 persons worked as dental hygienists in 1980, according to the U.S. Public Health Service. Many are employed part time. Most work in private dental offices; some may contract their services to several dentists or dental offices. Public health agencies, school systems, industrial plants, clinics, hospitals, dental hygiene schools, and the Federal Government are other sources of employment for dental hygienists. Some graduates of bachelor's degree programs are commissioned officers in the Armed Forces.

## Training, Other Qualifications, and Advancement

Dental hygienists must be licensed. To obtain a license, a candidate must graduate from an accredited dental hygiene school and pass both a written and a clinical examination. For the clinical examination, the applicant is required to perform dental hygiene procedures, such as removing deposits and stains from a patient's teeth. In 1980, candidates in 48 States and the District of Columbia could complete part of the State licensing requirements by passing a written examination given by the National Board of Dental Examiners. Few States permit dental hygienists licensed in other States to practice in their jurisdictions without further examination.

In 1980, 210 schools of dental hygiene in the United States were accredited by the Commission on Dental Accreditation. Most programs grant an associate degree; others lead to a bachelor's degree. A few institutions offer both types of programs. Six schools offer master's degree programs in dental hygiene.

Completion of an associate degree program usually is sufficient for the dental hygienist who wants to practice in a private dental office. To do research, teach, and work in public or school health programs, at least a bachelor's degree usually is required. Dental hygienists with a master's degree work as teachers or administrators in dental hygiene and dental assisting training programs, public health agencies, and in associated research.

Competition is keen for admission to dental hygiene schools. The minimum requirement for admission to a school of dental hygiene is graduation from high school. Several schools that offer the bachelor's degree admit students to the dental hygiene program only after they have completed 2 years of college. Many schools also require that applicants take an aptitude test given by the American Dental Hygienists' Association. Dental hygiene training given in the Armed Forces usually does not fully prepare one to pass the licensing exam, but credit for that training may be granted to those who

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seek admission to accredited dental hygiene programs.

The curriculum in a dental hygiene program consists of courses in the basic sciences, dental sciences, clinical sciences, and liberal arts. These schools offer laboratory, clinical, and classroom instruction in subjects such as anatomy, physiology, chemistry, pharmacology, nutrition, histology (the study of tissue structure), periodontology (the study of gum diseases), dental materials, and clinical dental hygiene.

People who want to become dental hygienists should enjoy working with others. The ability to put patients at ease is helpful, for patients often are under stress. Personal neatness, cleanliness, and good health also are important qualities. Dental hygienists must have manual dexterity because they use various dental instruments with little room for error within a patient's mouth. Among the courses recommended for high school students interested in careers in this occupation are biology, health, chemistry, speech, and mathematics.

## Job Outlook

Employment opportunities for dental hygienists are expected to be very good through the 1980's. Despite an anticipated rise in the number of graduates from schools of dental hygiene, demand is expected to be greater than supply if recent trends in enrollments continue. There also should be good opportunities for those desiring part-time employment and for those willing to work in rural areas.

Employment of dental hygienists is expected to grow much faster than the average for all occupations because of the demand for dental care that will be generated by an expanding population, the growing awareness of the importance of oral health, and an increase in dental prepayment plans. The use of dental auxiliaries is more prevalent in some places than others, however; more widespread acceptance on the part of dentists of the value of the hygienist in increasing the dentist's productivity is likely to spur demand for these workers in areas where they are not extensively utilized. Younger dentists, in particular, tend to hire hygienists, because they are taught in dental school how to make effective use of auxiliaries in their dental practice. The trend toward group practice among dentists should also result in jobs for dental hygienists.

## Earnings

Earnings of dental hygienists are affected by the type of employer, education, and experience of the individual hygienist, and the geographic location. Dental hygienists who work in private dental offices usually are salaried employees, although some are paid a commission for work performed, or a combination of salary and commission.

Dental hygienists working full time in private offices earned between $14,000 and $17,000 a year in 1980, according to the limited data available. In 1980, the Federal Government paid dental hygienists with no experience starting salaries of about $11,000 a year. Dental hygienists working for the Federal Government earned average annual salaries of about $13,100. Public health dental hygienists earned average annual salaries of about $14,250 in 1980.

Dental hygienists who work for school systems, health agencies, the Federal Government, or State agencies have the same hours, vacation, sick leave, retirement, and health insurance benefits as other workers in these organizations.

## Related Occupations

Dental hygienists relieve dentists from many routine tasks. Other occupations performing similar duties for dentists and physicians include dental assistants, dental laboratory technicians, general duty nurses, nurse anesthetists, and radiologic technologists.

## Sources of Additional Information

For information about accredited programs and the educational requirements to enter this occupation, contact:

Division of Professional Development, American Dental Hygienists' Association, Suite 3400, 444 N. Michigan Ave., Chicago, Ill. 60611.

The State Board of Dental Examiners in each State, or the National Board of Dental Examiners, 211 E. Chicago Ave., Chicago, Ill. 60611, can supply information on licensing requirements.

# Electrocardiograph Technicians

(D.O.T. 078.362-018)

## Nature of the Work

Electrocardiograms (EKG's) are graphic heartbeat tracings produced by an instrument called an electrocardiograph. These tracings record the electrical changes that occur during and between heartbeats. Physicians order electrocardiograms to diagnose certain forms of heart disease including irregularities in heart action and to analyze changes in the condition of a patient's heart over a period of time. Some physicians use electrocardiograms as a routine diagnostic procedure for persons who have reached a certain age. In many fields, electrocardiograms are required as part of preemployment physical examinations. Often the test is done for surgery.

Many new cardiac tests are used today, including "invasive" tests such as cardiac catheterization, in which a tube (catheter) is inserted through the patient's blood vessel into the heart. Generally, EKG's are used together with these other cardiac tests.

Since the equipment is mobile, EKG technicians can record electrocardiograms in a doctor's office, in the EKG department of a hospital, or at the patient's bedside. After explaining the procedure to the patient, the technician attaches from 3 to 12 electrodes—also called "leads"—to the chest, arms, and legs of the patient. Often the technician applies a gel between the electrodes and the patient's skin, to facilitate the passage of the electrical impulses. The patient usually lies down, face up, during this procedure. By manipulating switches on the electrocardiograph and repositioning the electrodes across the chest, the technician produces various tracings of the heart's electrical action. A stylus records the tracings on a long roll of graph paper. The test may be given while the patient is resting, or is doing exercise. The technician must know the anatomy of the chest and heart to properly select the exact locations for the chest electrodes. If the electrodes are placed in the wrong location, an inaccurate reading will result.

After the recording has been completed, the technician prepares the electrocardiogram for analysis by a physician, usually a heart specialist. Technicians must be able to recognize and correct any technical errors, such as crossed wires or electrical interference, that prevent an accurate reading. They also must call the doctor's attention to any significant deviations from the norm.

EKG technicians sometimes conduct other tests such as vectorcardiograms, which are multidimensional traces; stress testing (exercise tests); pulse recordings; and Holter monitoring and scanning, which is a 12- to 24-hour recording of the EKG on magnetic tape. In addition, some technicians schedule appointments, type doctors' diagnosis, maintain patients' EKG files, and care for equipment.

## Working Conditions

Unless they are involved in an emergency case, EKG technicians usually work in a relaxed atmosphere. A lot of their time is spent on their feet. They work directly with patients and therefore must be able to relate to many kinds of people.

Technicians generally work a 5-day, 40-hour week, which may include Saturdays and Sundays. Those working in hospitals also may be required to work evening hours.

## Employment

Nearly 20,000 persons worked as electrocardiograph technicians in 1980. Most EKG technicians worked in cardiology departments of large hospitals. Others worked part time in small general hospitals where workloads are usually not great enough to demand full-time technicians. Some worked full or part time in clinics and cardiologists' offices.

## Training, Other Qualifications, and Advancement

Most EKG technicians are trained on the job. Training—usually conducted by an EKG supervisor or a cardiologist—lasts up to 1 month for basic EKG tests and up to 1 year

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EKG technicians must know exactly where to place the electrodes on the patient's body.

for more complex ones. Applicants for on-the-job training generally must be high school graduates. High school courses that are recommended for students interested in this field include health, biology, and typing. Familiarity with medical terminology is helpful; it can be acquired in classes on human anatomy and physiology and by studying a medical dictionary.

Formal training programs offered by vocational and technical schools and junior and community colleges also provide these skills. The basic EKG test can be learned in courses lasting 6 weeks. The 1- to 2-year programs provide more extensive training. The American Cardiology Technologists Association (ACTA) recognizes some of these programs. Training also is available in the Armed Forces.

The American Cardiology Technologists Association administers two written examinations—one for proficiency in the basic EKG procedure; the other for proficiency in both the basic and advanced EKG procedures. EKG technicians who pass earn the title of Certified Cardiology Technologist and Registered Cardiology Technologist, respectively. These credentials may help EKG technicians obtain better paying positions.

Persons who want to become EKG technicians should have mechanical aptitude, the ability to follow detailed instructions, presence of mind in emergencies, reliability, and patience.

EKG technician is the entry level position in the field of cardiovascular technology, and opportunities for advancement are good. With proper training and experience, EKG technicians can advance to monitor technicians, Holter monitoring technicians, stress testing technicians, echocardiogram technicians, cardiac catheterization technicians, cardiovascular technicians, cardiopulmonary technicians, and cardiology technologists. Promotion to supervisory positions also is possible.

## Job Outlook

Employment of EKG technicians is expected to grow faster than the average for all occupations through the 1980's due to more extensive use of EKG's during routine physical examinations, prior to surgery, and in conjunction with other cardiac tests. Other factors contributing to the increased demand for EKG technicians include general population growth, greater health consciousness, and the widespread availability of health insurance programs that help people pay for diagnostic procedures. Demand also should increase due to the rising proportion of older persons, the segment of the population requiring the most cardiac testing.

In addition to job openings resulting from increased demand for EKG technicians, many vacancies will occur as workers transfer to other kinds of work, retire, or die. Technicians with formal training or Armed Forces training should find the most favorable prospects.

## Earnings

EKG technicians employed in hospitals, medical schools, and medical centers earned starting salaries of about $10,200 a year in 1981, according to a survey conducted by the University of Texas Medical Branch. Some experienced EKG technicians earned as much as $17,800 a year.

EKG technicians employed by the Federal Government are called Medical Machine Technicians. Depending on their education and experience in this occupation, beginners could earn annual salaries ranging from $10,963 to $16,826 in 1981. Usually, EKG technicians earn slightly less than the average for all nonsupervisory workers in private industry, except farming.

In general, those EKG technicians with previous formal training earn higher starting salaries than those who learn on the job. Also, EKG technicians who perform more sophisticated tests are paid more than those who perform only basic ones.

EKG technicians in hospitals receive the same fringe benefits as other hospital personnel, including hospitalization, vacation, and sick leave benefits. Some institutions provide tuition assistance or free education courses, pension programs, and uniforms.

## Related Occupations

Some other occupations requiring operation of technical equipment to test a patient's medical condition include audiometrists, electroencephalographic (EEG) technologists and technicians, radiologic (X-ray) technologists, and medical laboratory workers.

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## Sources of Additional Information

Local hospitals can supply information about employment opportunities.

The American Cardiology Technologists Association responds to inquiries about membership and their credentialing program. Contact them at:

American Cardiology Technologists Association, 1 Bank St., Suite 307, Gaithersburg, Md. 20760.

# Electroencephalographic Technologists and Technicians

(D.O.T. 078.362-022)

## Nature of the Work

The field of electroencephalography (EEG) is concerned with recording and studying the electrical activity of the brain. A machine called an electroencephalograph records this activity and produces a written tracing of the brain's electrical impulses. This record of brain waves is called an electroencephalogram. Neurologists and other qualified medical practitioners use electroencephalograms to help diagnose the extent of injury for patients suspected of having brain tumors, strokes, or epilepsy; to measure the consequences of infectious diseases on the brain; and to determine if there is any organic explanation in cases where individuals suffer from serious adjustment problems or learning difficulties. EEG also may be used prior to vital organ transplant operations, to help determine when the potential donor is "medically" dead.

The people who operate EEG equipment are known as EEG technicians and technologists. The main job of an EEG technician is to produce electroencephalograms, under the supervision of an EEG technologist or an electroencephalographer (a physician specializing in electroencephalography). Before doing this job, the technician takes a simplified medical history of the patient and helps the patient relax for the test. The technician then applies the electrodes of the electroencephalograph to designated spots on the patient's head and makes sure that the machine is working well. The technician chooses the most appropriate combinations of instrument controls and electrodes to produce the kind of record needed. EEG technicians must be able to recognize and correct any artifacts that appear (an artifact is an electrical or mechanical event that comes from somewhere other than the brain, such as eye movement or interference from electrical lights). If there are any mechanical problems with the electroencephalograph, the technician must advise his or her supervisor, so that the machine can be repaired promptly. EEG technicians must know how to recognize changes in the patient's neurologic, cardiac, and respiratory status. EEG technicians also need a basic understanding of the kinds of medical emergencies that can occur in laboratories to be able to react properly if an emergency arises. For example, if a patient suffers an epileptic seizure, the EEG technician must take the proper action.

EEG technologists usually perform all the duties of EEG technicians but have a broader knowledge of the various aspects of EEG work. They also may use EEG equipment in conjunction with other electrophysiologic monitoring devices, such as tape recorders, computers, and video equipment. They also can repair the equipment if it is not working properly. After producing an EEG recording, the technologist may be asked to write a description of the recording for the use of the electroencephalographer.

Supervising EEG technicians is part of an EEG technologist's job. Besides direct supervision during EEG recordings, this includes such things as arranging work schedules and teaching EEG techniques. Technologists often have administrative responsibilities, such as managing the laboratory, keeping records, scheduling appointments, ordering supplies, and establishing protocol.

## Working Conditions

EEG technologists and technicians usually work in clean, well-lighted surroundings. About half of their time on duty is spent on their feet and a lot of bending over is necessary. They may have to contend with patients who are unruly or very ill.

EEG technicians watch closely for any malfunctioning of the equipment.

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A 5-day, 40-hour workweek with little overtime is normal, although some hospitals require EEG technologists and technicians to be "on call" (ready to report to work at a moment's notice) after hours and on weekends and holidays. These employees generally work during the day, but those involved in sleep studies work evenings and nights.

## Employment

About 5,000 persons worked as electroencephalographic technologists and technicians in 1980. Most worked full time. Although most EEG personnel work in hospitals, jobs are also available in private offices of neurologists and neurosurgeons.

## Training, Other Qualifications, and Advancement

Most EEG technicians working in 1980 had learned their skills on the job. Applicants for EEG trainee positions need a high school diploma, as a rule. Often, EEG trainees in hospitals transfer to the neurology department from other jobs in the hospital, such as EKG technicians. With advances in medical technology, however, electroencephalographic equipment has become increasingly sophisticated and its use requires technicians with more training and skill.

Formal training for EEG personnel is offered by hospitals, medical centers, community colleges, vocational-technical institutes, and colleges and universities. In 1980, there were 53 formal training programs, 19 of which were approved by the American Medical Association's Committee on Allied Health Education and Accreditation. Programs usually last from 1 to 2 years and include laboratory experience as well as classroom instruction in neurology, anatomy, neuroanatomy, physiology, neurophysiology, clinical and internal medicine, psychiatry, and electronics and instrumentation. Graduates receive associate degrees or certificates. High school graduation normally is required for entrance into these programs.

EEG personnel who have 1 year of training and laboratory experience, and who successfully complete a written and oral examination administered by the American Board of Registration of Electroencephalographic Technologists (ABRET), are designated "Registered EEG Technologist" (R. EEG T.). Although not a requirement for employment, registration by ABRET is acknowledgment of a technologist's qualifications and makes better paying jobs easier to obtain.

Persons who want to enter this field should have manual dexterity, good vision, an aptitude for working with electronic equipment, and the ability to work with patients as well as with other health professionals. High school students considering a career in this occupation should take courses in health, biology, human anatomy, and mathematics.

Some EEG technologists in large hospitals can advance to chief EEG technologist and take on increased responsibilities in laboratory management and in teaching basic techniques to new personnel or students from EEG training programs. Chief EEG technologists generally are supervised by an electroencephalographer, or a neurologist or neurosurgeon.

## Job Outlook

Employment of EEG technologists and technicians is expected to grow faster than the average for all occupations through the 1980's due to the increased use of EEG's in surgery, in diagnosing and monitoring patients with brain disease, and in research on the human brain. EEG technologists and technicians increasingly will perform other clinical electrophysiological examinations—for example, somatosensory, visual, and auditory evoked responses—that have been made possible by recent advances in clinical neurophysiology. Contributing to the increased demand for EEG technologists and technicians is the projected expansion of the health industry that is associated with a growing and aging population and greater access to health care through public and private health insurance programs.

In addition to openings from increased demand for EEG technologists and technicians, many openings will arise when workers transfer to other kinds of work, retire, or die. Job prospects will be best for persons who have graduated from a formal training program or are registered by ABRET.

## Earnings

Starting salaries of EEG technicians employed by hospitals, medical schools, and medical centers averaged $11,600 a year in 1981, according to a survey by the University of Texas Medical Branch. Starting salaries for registered EEG technologists were $1,000 to $2,000 higher. Usually, EEG technicians earn about as much as the average for all nonsupervisory workers in private industry, except farming. Top salaries of experienced EEG technicians ranged as high as $20,400 a year. Highly qualified technologists may earn more as teachers in special training situations, supervisors of EEG laboratories, or program directors of schools of EEG technology.

EEG technologists and technicians employed by the Federal Government are called Medical Machine Technicians. Depending on education and experience, beginning annual salaries ranged from $10,963 to $16,826 in early 1981.

EEG technologists and technicians in hospitals receive the same benefits as other hospital personnel, including hospitalization, vacation, and sick leave benefits. Some institutions may provide tuition assistance or free courses, pension programs, uniforms, and parking.

## Related Occupations

Other occupations whose main work consists of performing medical activities under supervision are audiometrists, dental assistants, electrocardiograph technicians, electrodiagnostic technicians, licensed practical nurses, nursing aides, occupational therapy assistants, surgical technicians, orderlies, physical therapy aides, and psychiatric aides.

## Sources of Additional Information

Local hospitals can supply information about employment opportunities.

For general information about a career in electroencephalography as well as a list of accredited formal training programs, contact:

Executive Office, American Society of EEG Technologists, 32500 Grand River Ave., #103, Farmington, Mich. 48024.

Information on registration with ABRET is available from:

The Psychological Corporation, 304 E. 45th St., New York, N.Y. 10017.

# Emergency Medical Technicians

(D.O.T. 079.374-010)

## Nature of the Work

An automobile accident, a heart attack, a near drowning, an unscheduled childbirth, a poisoning, a gunshot wound—all of these situations demand urgent medical attention. Seeing medical emergencies like these handled on television has made millions of Americans aware of the crucial role played by emergency medical technicians (EMT's), sometimes called ambulance attendants.

A call from a dispatcher sends EMT's—who usually work in teams of two—to the scene of the emergency. Although speed is essential, the EMT's obey the traffic laws for the operation of emergency vehicles. They also must know the best route to take in the face of traffic, road construction, and weather conditions.

Upon arriving at the scene of the emergency, the driver parks the ambulance in a safe place to avoid accidents. If no police are present, bystanders may be enlisted to lend a hand. For instance, in the case of an automobile accident, bystanders can help control traffic by placing road flares, removing debris, and redirecting traffic.

EMT's first determine the nature and extent of the victims' illnesses or injuries and establish priorities for emergency medical care. They look for medical identification emblems that denote if the victim has epilepsy, diabetes, or other similar medical conditions, so they can provide the correct treatment. EMT's give appropriate emergency care, including opening and maintaining an airway, restoring breathing, controlling bleeding, treating for shock, immobilizing fractures, bandaging, assisting in childbirth, managing mentally disturbed patients, and giving initial care to poison and burn victims.

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When persons are trapped, such as in an automobile accident, EMT's face a double problem. First they must assess the victims' injuries and supply all possible emergency medical care and protection to the trapped persons. Then they must use the correct equipment and techniques to remove the victims safely. EMT's may request additional help or special rescue or utility services by radio or telephone from a dispatcher.

In case of death, EMT's notify the proper authorities and arrange for the protection of the deceased's property.

When patients must be transported to a hospital, EMT's place the patients on stretchers, lift them into the ambulance, and secure both the patients and the stretchers for the ride. EMT's then drive to the proper hospital, as determined by protocol, or lacking that, they choose the nearby hospital they consider best equipped and staffed to treat their patients. To assure prompt treatment upon arrival, EMT's report by radio directly to the hospital emergency department or the emergency dispatcher about the nature and extent of injuries or illness, the number of persons being transported, and the destination. They may ask for additional advice from the hospital's emergency medical staff.

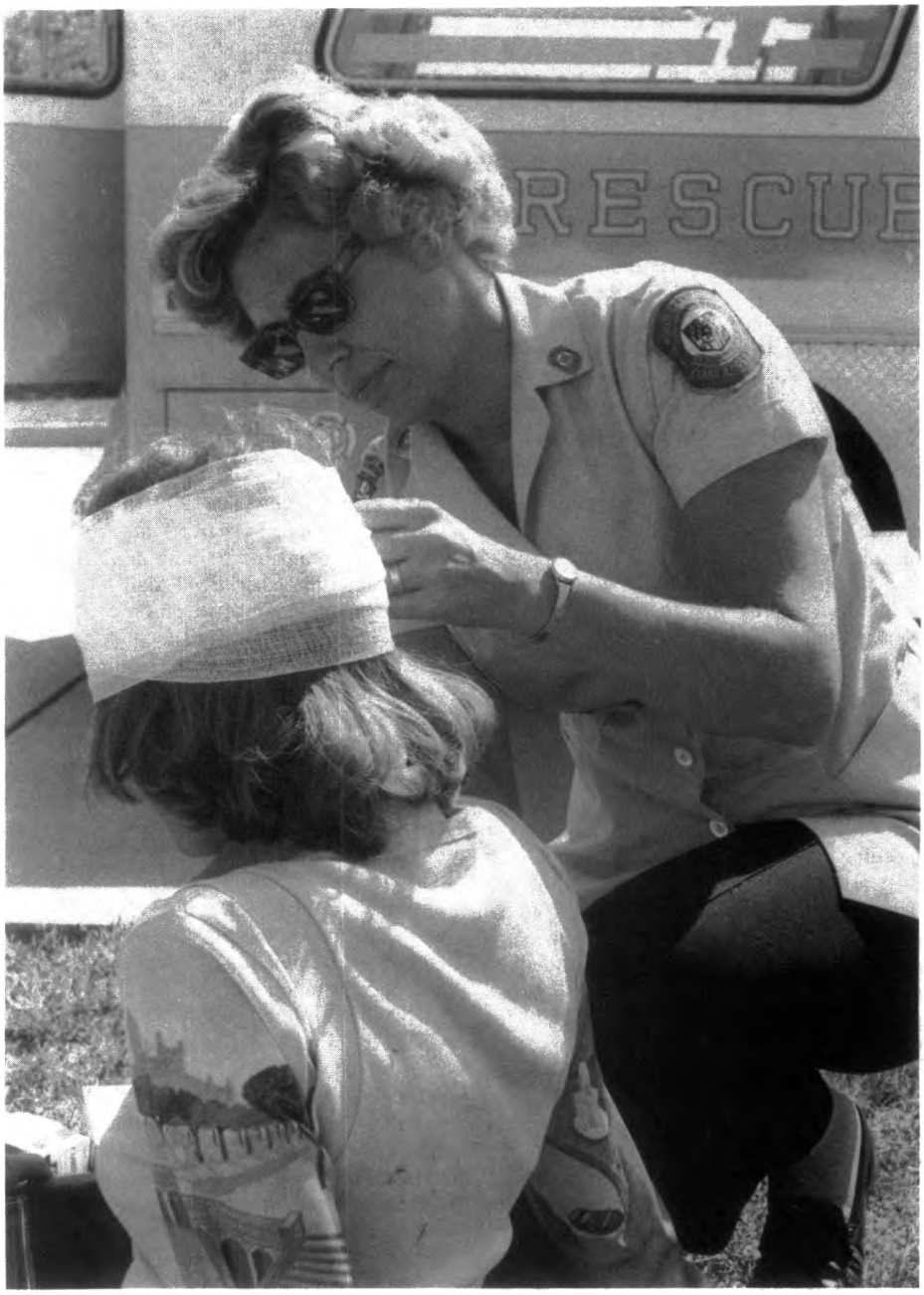
On the way to the emergency department, EMT's monitor patients' vital signs and give additional care as needed or as directed by a physician with whom they have radio contact.

Upon arrival at the hospital, they help transfer the patients from the ambulance to the emergency department. They report their observations and care of the patients to the emergency department staff for diagnostic purposes and as a matter of record. EMT's may help the emergency department staff.

One of the duties of EMT's is to maintain a clean, well-equipped ambulance. After each run, EMT's replace the used linen, blankets, and other supplies, send the reusable items to be sterilized, and carefully check all equipment so that the ambulance is ready for the next trip. If they have carried patients who have contagious infection, they decontaminate the interior of the ambulance and report such calls to the proper authorities. In cases of radiation contamination, they seek special experts to remove the radiation. EMT's make sure that the ambulance is in good operating condition by checking the gasoline, oil, tire pressure, lights, siren, heater, brakes, and communications equipment before their shift begins.

In addition to the basic EMT, whose work has been described, there are two other types of EMT's: EMT-Paramedics and EMT-Dispatchers. Working with radio communication under the direction of a physician, EMT-Paramedics may, depending on State law, administer drugs, both orally and intravenously, and use more complex equipment, such as a defibrillator, than basic EMT's.

Although they do not deal directly with emergency patients, EMT-Dispatchers nevertheless play an important role. They receive and process calls for emergency medical assistance. By telephone and radio, they serve as a communications link between the appropriate medical facility and those who are sent to attend the emergency patients. Dispatchers talk with the various parties involved and, in consultation with medical authorities, decide upon the best course of action. They then send the appropriate persons and resources to the emergency site and coordinate the movement of emergency medical vehicles. EMT-Dispatchers also handle communications for public safety agencies, such as police and fire departments, so that services like traffic and fire control can be performed.



Emergency medical technicians must act quickly when they arrive at the scene of an accident.

## Working Conditions

Because EMT's must treat patients indoors and out, they are exposed to all kinds of weather. Much of their time is spent standing, kneeling, bending, and lifting. Although their work can be very strenuous and can produce great pressure, they must be careful to avoid accidents.

EMT's employed by fire departments often have a 56-hour workweek. Those employed by hospitals, private firms, and police departments usually work 40 hours a week. Some EMT's, especially those in police and fire departments, have to be "on call" for extended periods. Volunteer EMT's have varied work schedules, but many put in from 8 to 12 hours a week. Because many ambulance services function 24 hours a day, EMT's often work nights and weekends.

## Employment

In 1980, an estimated 120,000 persons worked as paid EMT's, a small but growing number of whom were EMT-Paramedics.

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Roughly 170,000 more worked as volunteers on rescue squads—mostly associated with fire departments. Most paid EMT's worked full time, while most volunteer EMT's worked part time.

Many paid EMT's work for police and fire departments and private ambulance companies. Funeral homes providing ambulance service employ some EMT's, although in recent years many funeral homes have left this field. A few EMT's work on hospital-based ambulance squads. A small but growing number of EMT's work in hospital emergency departments.

## Training, Other Qualifications, and Advancement

Few EMT's received formal training until recent years. Now instruction in emergency medical care techniques is mandatory. A standard training course is the 100-hour program designed by the U.S. Department of Transportation. This program, or its equivalent, is available in all 50 States and the District of Columbia. It is offered by police, fire, and health departments; in hospitals; and as a special course in medical schools, colleges, and universities.

This course provides instruction and practice in dealing with emergencies such as bleeding, fractures, airway obstruction, cardiac arrest, and emergency childbirth. Students learn to use and care for common emergency equipment, such as backboards, suction machines, splints, oxygen delivery systems, and stretchers. Physicians, nurses, and experienced EMT's usually give the lectures and demonstrations.

After completing the basic EMT program, students may take a 2-day course dealing with the removal of trapped victims, as well as a 5-day course on driving emergency vehicles. Also available is a course lasting several days to train EMT-Dispatchers. Training programs for EMT-Paramedics generally last from 3 to 5 months. In 1980, there were about 350 training programs for EMT-Paramedics. The American Medical Association's Committee on Allied Health Education and Accreditation has recently begun accrediting these programs. In many places, refresher courses and continuing education are available to EMT's.

Although admission requirements vary from State to State and often, from course to course, admittance to an EMT training course generally requires that the applicant be at least 18 years old, have a high school diploma or the equivalent, and have a valid driver's license. Among high school subjects recommended for persons interested in the field are driver education and health and science courses. Training in the Armed Forces as a "medic" also is considered good preparation for prospective EMT's.

Graduates of approved EMT training programs who meet certain experience requirements and pass a written and practical examination administered by the National Registry of Emergency Medical Technicians earn the title of Registered EMT-Ambulance. To maintain their proficiency, EMT's must register again every 2 years. To reregister, an EMT must be working as an EMT, meet a continuing education requirement, and pay a fee.

In 1978, the National Registry began to register EMT-Paramedics. This registration requires current registration or State certification as an EMT-Ambulance, successful completion of an EMT-Paramedic training program, 6 months of field experience as an EMT-Paramedic, and passing a written and practical examination. Reregistration is required every 2 years.

Another type of registration was introduced in 1980, the EMT-Intermediate. This level of registration is above that for basic EMT's, but below that for EMT-Paramedics. The examination covers the first part of the EMT-Paramedic training curriculum and builds upon the basic EMT skill levels. Current registration or certification at the basic EMT level is a prerequisite.

Although not a general requirement for employment, registration with the National Registry is acknowledgment of an EMT's qualifications and makes higher paying jobs easier to obtain. In 1980, about 90,000 basic EMT's were registered.

In addition, all 50 States have some kind of certification procedure. In 13 States, registration with the National Registry is required. Seven other States offer the choice of their own certification examination or the National Registry examination. Twenty-nine States accept registration with the National Registry as the basis of reciprocity.

EMT's should have good dexterity and physical coordination. They must be able to lift and carry up to 100 pounds. EMT's need good eyesight (eyeglasses may be used) with accurate color vision.

Because EMT's often work under trying conditions, they must exercise good judgment under stress and have leadership ability. Emotional stability and the ability to adapt to many different situations help them handle difficulties. They should have a neat and clean appearance and a pleasant personality.

## Job Outlook

Employment of paid EMT's is expected to grow about as fast as the average for all occupations during the 1980's. As the population grows—the older segment in particular—more people are expected to use ambulance services, increasing the need for EMT's.

Also likely to contribute to the growth in demand for workers in the occupation are developments in the field of emergency medicine, which is emerging as a specialized field of practice for physicians, nurses, and allied health personnel. As the occupation of emergency medical technician becomes more professionalized, appropriately trained EMT's are assuming greater responsibility within the health care system. This upgrading of the profession is expected to create more jobs for paid EMT's in particular. Employment also will be spurred by the expansion of emergency medical services to such settings as nursing homes, factories, sports events, and international flights and cruises.

Still another factor influencing demand for paid EMT's is the switch from volunteer to paid ambulance services in many communities. A trend is apparent in some cities to establish ambulance service as the third essential community service, following police and fire protection. Growth in this area could be affected, however, by competing demands for the municipal dollar. Many ambulance services depend on local government funding, and budget constraints could limit growth or even force the elimination of some EMT jobs.

Persons seeking paid EMT positions with fire and police departments are expected to face stiffer competition than those seeking positions with private companies. In general, public EMT jobs offer higher salaries and better fringe benefits than those in the private sector. Further, in some communities, applicants for EMT jobs must contend with the generally stiff competition for any kind of position with the police or fire department.

In addition to job opportunities created by increased demand for EMT's, many openings will occur each year because of the need to replace those who transfer to other kinds of work, retire, or die.

## Earnings

Earnings of EMT's depend on the type of employer, the training and experience of the individual, and the geographic location.

In general, graduates of approved basic training programs received starting salaries of between $7,000 and $11,000 annually in 1980, depending on the community. With experience, they can earn up to $13,000 a year. Beginning EMT-Paramedics usually earn annual salaries of at least $10,000, while experienced EMT-Paramedics earn as much as $20,000 a year. EMT's employed by the Federal Government are called Emergency Ambulance Service Technicians. Depending on their education and experience in this occupation, applicants could earn beginning annual salaries ranging from $10,963 to $16,826 in early 1981. EMT's working for police and fire departments usually are paid the same salaries as police officers and firefighters. (See statements on police officers and firefighters elsewhere in the *Handbook*.)

The employee benefits offered by private companies, such as vacation, sick leave, and health insurance, vary widely. EMT's employed by hospitals and police and fire departments receive the same benefits as the other employees.

## Related Occupations

Other occupations in which workers often are placed in life-or-death situations that require quick and level-headed reactions are police officers and firefighters.

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## Sources of Additional Information

Information concerning training courses, registration, and job opportunities for prospective EMT's can be obtained by writing to the Emergency Medical Services Director of your State.

Information about the registration of EMT's also is available from:

National Registry of Emergency Medical Technicians, P.O. Box 29233, Columbus, Ohio 43229.

General information about EMT's is available from:

National Association of Emergency Medical Technicians, P.O. Box 334, Newton Highlands, Mass. 02161.

# Licensed Practical Nurses

(D.O.T. 079.374-014)

## Nature of the Work

Licensed practical nurses (LPN's) help care for the physically or mentally ill and infirm. Under the direction of physicians and registered nurses, they provide nursing care that requires technical knowledge but not the professional education and training of a registered nurse. (The work of registered nurses is described elsewhere in the *Handbook*.) In California and Texas, licensed practical nurses are called *licensed vocational nurses*.

In hospitals, LPN's provide much of the bedside care. They take and record temperatures and blood pressures, change dressings, administer certain prescribed medicines, and help patients with bathing and other personal hygiene. They assist physicians and registered nurses in examining patients and in carrying out nursing procedures. They also assist in the delivery, care, and feeding of infants. Some practical nurses work in specialized units such as intensive care or recovery rooms. There they perform special nursing procedures and operate sophisticated equipment to provide care for seriously ill or injured patients. In some instances, experienced LPN's supervise hospital attendants and nursing aides.

LPN's who work in private homes provide day-to-day patient care that seldom involves highly technical procedures or complicated equipment. In addition to providing nursing care, they may prepare meals, see that patients are comfortable, and help keep up their morale. They may teach family members how to perform simple nursing tasks.

In doctors' offices and in clinics, LPN's prepare patients for examination and treatment, administer medications, apply dressings, and teach patients prescribed health care regimens. They also may make appointments and record information about patients.

## Working Conditions

Practical nurses in hospitals generally work 40 hours a week, but often this includes some work at night and on weekends and holidays. Although the work is not strenuous, they often must stand for long periods and help patients move in bed, stand, or walk.

In private homes, LPN's usually work 8 to 12 hours a day and go home at night. Private duty nursing affords a great deal of independence in setting work hours and the length and frequency of vacations.

## Employment

About 550,000 persons worked as LPN's in 1980, according to the U.S. Public Health Service. About three-fifths worked in hospitals. Many others worked in nursing homes, rehabilitation centers, psychiatric hospitals, and other long-term care facilities. Some LPN's had jobs in clinics or doctors' offices. Self-employed nurses worked in hospitals or in the homes of their patients.

## Training, Other Qualifications, and Advancement

All States and the District of Columbia require practical nurses to have a license. To qualify, applicants must complete a State-approved practical nursing course and pass a written examination. Educational requirements for enrollment in State-approved programs range from completion of eighth or ninth grade to high school graduation. Many schools do not require a high school diploma but prefer graduates. In addition, physical examinations and aptitude tests usually are required.

LPN's provide much of the bedside care in hospitals and nursing homes.

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In 1980, about 1,230 State-approved programs provided practical nursing training. Trade, technical, or vocational schools offered more than half of these programs. Other programs were available at community and junior colleges, hospitals, and health agencies. Several programs operated by the Armed Forces for military personnel were State-approved for practical nurse training. Graduates of these programs can apply for licensure.

Practical nurse training programs generally last 1 year and include both classroom study and clinical practice. Classroom instruction covers nursing concepts and principles and related subjects including anatomy, physiology, medical-surgical nursing, pediatrics, obstetrics, psychiatric nursing, administration of drugs, nutrition, first aid, and community health. In addition, students receive supervised clinical experience—usually in a hospital.

LPN's should be emotionally stable and have a deep regard for human welfare, because work with the sick and injured can be upsetting. As part of a health care team, they must be able to follow orders and work under close supervision.

Advancement opportunities are limited, although in-service educational programs prepare some LPN's for work in specialized areas, such as postsurgery recovery rooms or intensive care units.

Increasingly, however, practical nurse training programs are being designed to allow practical nurse graduates to continue their education, eventually satisfying the formal requirements for registered nurse. For example, in over 80 associate degree RN programs, the first year of study satisfies the educational requirements for LPN. After this first year of study, students can apply for licensure as a practical nurse and begin working, or complete both years of coursework and seek licensure as a registered nurse.

## Job Outlook

The employment outlook for LPN's should be very good through the 1980's. Employment is expected to rise faster than the average for all occupations in response to the needs of a growing and aging population and the widespread availability of public and private health insurance. Also, newly licensed practical nurses will be needed each year in large numbers to replace those who retire or leave the occupation for other reasons.

## Earnings

According to surveys conducted by the Bureau of Labor Statistics, LPN's in hospitals earned about $12,500 a year in 1980, on average, while those in nursing homes earned about $11,400 a year.

Federal hospitals offered beginning LPN's an annual salary of $8,952 in 1981.

Many hospitals give pay increases after specific periods of satisfactory service. Paid holidays and vacation, health insurance, and pension plans are typical benefits provided by hospitals.

## Related Occupations

Other jobs that involve working closely with people while helping them include: Emergency medical technician, social service aide, and teacher aide.

## Sources of Additional Information

A list of State-approved training programs and information about practical nursing is available from:

National League for Nursing, 10 Columbus Circle, New York, N.Y. 10019.

National Association for Practical Nurse Education and Service, Inc., 254 West 31st St., New York, N.Y. 10001.

For information about a career in practical nursing, contact:

National Federation of Licensed Practical Nurses, Inc., 250 West 57th., New York, N.Y. 10106.

Information about employment opportunities in Veterans Administration hospitals is available from local Veterans Administration hospitals and also from:

Department of Medicine and Surgery, Veterans Administration, Washington, D.C. 20420.

# Medical Laboratory Workers

(D.O.T. 078.121-010, .261-010 and -014, .281-010, .361-014 and -030, .381-010 and -014, and .687-010)

## Nature of the Work

Laboratory tests play an important part in the detection, diagnosis, and treatment of many diseases. Medical laboratory workers, often called clinical laboratory workers, include three levels of personnel: Medical technologists, technicians, and assistants. They perform laboratory tests on specimens taken from patients by other health professionals, such as physicians. They perform these tests under the general direction of pathologists (physicians who diagnose the causes and nature of disease) and other physicians, or doctoral scientists who specialize in clinical chemistry, microbiology, or the other biological sciences. Medical laboratory workers analyze blood, tissues, and fluids in the human body by using precision instruments such as microscopes and automatic analyzers.

*Medical technologists*, who usually have 4 years of postsecondary school training, perform complicated chemical, biological, hematological, microscopic, and bacteriological tests. These may include chemical tests to determine, for example, the blood cholesterol level, or microscopic examination of the blood to detect the presence of diseases such as leukemia. Technologists microscopically examine other body fluids; make cultures of body fluid or tissue samples to determine the presence of bacteria, parasites, or other microorganisms; and analyze the samples for chemical content or reaction. They also may type and cross-match blood samples for transfusions.

Technologists in small laboratories perform many types of tests, while those in large laboratories usually specialize. Among the areas in which they can specialize are biochemistry (the chemical analysis of body fluids), blood bank technology (the laboratory work of a blood bank), cytotechnology (the study of human body cells), hematology (the study of blood cells), histology (the study of human and animal tissue), and microbiology (the study of bacteria and other microorganisms).

Most medical technologists conduct tests related to the examination and treatment of patients. Others do research, develop laboratory techniques, teach, or perform administrative duties.

*Medical laboratory technicians*, who generally have 2 years of postsecondary school training, perform tests and laboratory procedures that require a high level of skill but not the in-depth knowledge of highly trained technologists. Like technologists, they may work in several areas or specialize in one field.

*Medical laboratory assistants*, who generally have a year of formal training, assist medical technologists and technicians in routine tests and related work that can be learned in a relatively short time. In large laboratories, they may specialize in one area of work. For example, they may identify different types of blood cells on slides. In addition to performing less complex tests, assistants may store and label plasma; clean and sterilize laboratory equipment, glassware, and instruments; prepare solutions following standard laboratory formulas and procedures; keep records of tests; and identify specimens.

## Working Conditions

Medical laboratory personnel generally work a 5-day, 40-hour week. Those working in a hospital can expect some evening and weekend duty. Laboratory workers may spend a great deal of time on their feet.

Laboratories generally are well lighted and clean. Although unpleasant odors and infectious materials often are present, few hazards exist if proper methods of sterilization and handling of specimens, materials, and equipment are used.

## Employment

About 205,000 medical laboratory workers were employed in 1980. Most medical laboratory personnel work in hospitals. Others work in independent laboratories, physicians' offices, clinics, public health agencies, pharmaceutical firms, and research institutions. Laboratory facilities generally are concentrated in metropolitan areas. Some medical laboratory workers work part time.

In 1980, Veterans Administration hospitals and laboratories employed about 3,000 medical technologists and about 1,700 medical

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laboratory technicians. Others worked for the Armed Forces and the U.S. Public Health Service.

## Training, Other Qualifications, and Advancement

The minimum educational requirement for a beginning job as a medical technologist is 4 years of college including completion of a specialized training program in medical technology.

Undergraduate work includes satisfactory completion of courses in chemistry, biological sciences, and mathematics. These studies give the technologist a broad understanding of the scientific principles underlying laboratory work. Specialized training usually requires 12 months of study and includes extensive laboratory work. In 1980, about 650 hospitals and schools offered programs accredited by the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association through the National Accrediting Agency for Clinical Laboratory Sciences. Many of these programs were affiliated with colleges and universities where a bachelor's degree is awarded upon completion. A few hospital-based programs require a bachelor's degree for entry.

Many universities offer advanced degrees in medical technology and related clinical laboratory sciences for technologists who plan to specialize in a certain area of laboratory work or in teaching, administration, or research.

Medical laboratory workers use sophisticated equipment to test body fluids and tissues.

Medical laboratory technicians acquire their training in a variety of educational settings. Many enroll in accredited programs, 2 years in length, offered by community and junior colleges and colleges and universities. Some are trained in the Armed Forces. Other technicians receive training in vocational and technical schools. In 1980, the CAHEA accredited 105 of these programs, and the Accrediting Bureau of Health Education Schools accredited 30.

Most medical laboratory assistants are trained on the job. In recent years, however, an increasing number have completed 1-year training programs conducted by hospitals, community and junior colleges, or vocational schools. In 1980, the CAHEA accredited 99 training programs for medical laboratory assistants. Applicants should be high school graduates or have an equivalency diploma with courses in science and mathematics. The programs include classroom instruction and practical training in the laboratory. They often begin with a general orientation to the clinical laboratory followed by courses in bacteriology, serology, parasitology, hematology, clinical chemistry, blood banking, and urinalysis.

In 1980, CAHEA also accredited 74 training programs for cytotechnologists, 47 for histologic technicians, and 57 for specialists in blood bank technology.

After they pass the appropriate examinations, medical technologists may be certified as Medical Technologists, MT (ASCP), by the Board of Registry of the American Society of Clinical Pathologists; Medical Technologists, MT, by the American Medical Technologists; Clinical Laboratory Scientists, CLS, by the National Certification Agency for Medical Laboratory Personnel; or Registered Medical Technologists, RMT, by the International Society of Clinical Laboratory Technology. These organizations also certify technicians.

Some States require both medical technologists and medical laboratory technicians to be licensed. They are: Alabama, Florida, Georgia, Hawaii, Illinois, Kentucky, Nevada, New Hampshire, New Jersey, and Tennessee. In California, New York, and Pennsylvania only technologists need to be licensed. Requirements for licensure in some States include a written examination.

Accuracy, dependability, and the ability to work under pressure are important personal characteristics for a medical laboratory worker. Manual dexterity and normal color vision are highly desirable.

Persons interested in a medical laboratory career should use considerable care in selecting a training program. They should get information about the kinds of jobs obtained by graduates, educational costs, the accreditation of the school, the length of time the training program has been in operation, instructional facilities, and faculty qualifications.

Technologists may advance to supervisory positions in certain areas of laboratory work, or, after several years' experience, to administrative medical technologist in a large hospital. Graduate education in one of the biological sciences, chemistry, management, or education usually speeds advancement. Technicians can advance to technologists by getting additional education and experience. Similarly, assistants can become technicians by acquiring more education and experience.

## Job Outlook

Employment of medical laboratory workers is expected to expand faster than the average for all occupations through the 1980's as physicians continue to make extensive use of laboratory tests in routine physical checkups and in the diagnosis and treatment of disease. Indirectly influencing growth of the field are population growth, greater health consciousness, and the widespread availability of public and private health insurance.

The use of automated laboratory test equipment is expected to lead to an increase in the number of medical laboratory technicians and assistants relative to technologists. Through technological advances, technicians and assistants can operate equipment to per-

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form tests that previously required the skill of a technologist.

Technologists will be needed to fill supervisory positions in all laboratories. In addition to openings resulting from increased demand for these workers, many jobs will become available each year because of the need to replace medical workers who transfer to other kinds of work, retire, or die.

## Earnings

Salaries of medical laboratory workers vary depending on the employer and geographic location. In general, medical laboratory workers employed in large cities received the highest salaries.

Starting salaries for medical technologists employed by hospitals, medical schools, and medical centers averaged about $15,800 a year in 1981, according to a survey conducted by the University of Texas Medical Branch. Beginning salaries for medical laboratory technicians averaged about $12,200 a year in 1981; for cytotechnologists, about $14,700; for histology technicians, about $12,600. According to the same survey, experienced medical technologists working in hospitals, medical schools, and medical centers averaged about $20,600 a year in 1981. Similarly, medical laboratory technicians with experience averaged about $16,000 a year; cytotechnologists, $18,100; histology technicians, $15,900.

The Federal Government paid newly graduated medical technologists with a bachelor's degree a starting salary of about $12,300 a year in 1981. Those having experience, superior academic achievement, or a year of graduate study entered at about $15,200. The Federal Government paid medical laboratory assistants and technicians starting salaries ranging from about $9,800 to $12,300 a year in 1981, depending on the amount and type of education and experience. Medical technologists in the Federal Government averaged about $17,500 a year, and medical technicians, about $14,700 a year, in 1980.

Medical laboratory workers normally receive vacation and sick leave benefits; some have retirement plans.

## Related Occupations

Medical laboratory workers perform a wide variety of tests to help physicians diagnose and treat disease. Their principal activity is the analysis and identification of substances. Workers in other occupations who perform laboratory tests include biological aides, chemistry technologists, criminalists, and food testers.

## Sources of Additional Information

Information about education and training for medical technologists, technicians, and laboratory assistants who meet standards recognized by the American Medical Association, the U.S. Department of Education, or both, as well as career information on these fields, is available from:

American Society of Clinical Pathologists, Board of Registry, P.O. Box 12270, Chicago, Ill. 60612.

American Society for Medical Technology, 330 Meadowfern Drive, Houston, Tex. 77067.

American Medical Technologists, 710 Higgins Rd., Park Ridge, Ill. 60068.

Accrediting Bureau of Health Education Schools, Oak Manor Office, 29089 U.S. 20 West, Elkhart, Ind. 46514.

National Certification Agency for Medical Laboratory Personnel, 1625 I St. NW., Suite 123, Washington, D.C. 20006.

For information about other technician training programs, contact:

International Society for Clinical Laboratory Technology, 818 Olive St., St. Louis, Mo. 63101.

For a list of training programs for medical technologists, technicians, and assistants that are approved by the American Medical Association, write:

Department of Allied Health Education and Accreditation, American Medical Association, 535 N. Dearborn St., Chicago, Ill. 60610.

For a list of training programs for medical laboratory technicians accredited by the Accrediting Bureau of Health Education Schools, write:

Secretary-ABHES, 29089 U.S. 20 West, Elkhart, Ind. 46514.

Information about employment opportunities in Veterans Administration hospitals is available from the Office of Personnel (O54E), Veterans Administration, Washington, D.C. 20420.

Information about clinical and research employment opportunities with the National Institutes of Health is available from the Clinical Center, National Institutes of Health, Bethesda, Md. 20205.

# Medical Record Technicians and Clerks

(D.O.T. 079.367-014 and 245.362-010)

## Nature of the Work

A medical record documents a patient's condition and treatment in a hospital, clinic, or other health care institution. Physicians, allied health personnel, hospital administrators, public health authorities, and insurance companies rely on these records, which medical record technicians and clerks maintain.

Developing and maintaining a medical information system for a hospital or other health facility requires the teamwork of medical record administrators, technicians, and clerks. The work of medical record administrators is described elsewhere in the *Handbook*. Technicians and clerks do most of the gathering and organizing of medical records. These workers transcribe medical data, analyze and code information, file, maintain registries, compile statistics, and abstract records.

In large hospitals, a medical administrator supervises and coordinates recordkeeping activities, but in smaller hospitals, experienced medical record technicians often manage the department. In most nursing homes, a medical record clerk, working under a medical record consultant who is a Registered Record Administrator (RRA) or an Accredited Record Technician (ART), is responsible for medical records.

Medical record clerks perform routine clerical tasks. They assemble information for records in sequence; check all forms, signatures, and dates; and locate the patient's previous medical records. They code and enter selected information such as sex, age, and referral source on the record. Medical record clerks answer routine requests and gather statistics for reports. Some medical record clerks transcribe reports of operations, X-ray and laboratory examinations, and special treatments given to patients.

Medical record technicians perform duties that may need more technical knowledge than record clerks. The technician codes diseases, operations, and special therapies according to recognized classification systems and enters the codes on medical records for easier review of the patient's history. Analyzing records and cross-indexing medical information make up a large part of the technician's work. Technicians review records for consistency, completeness, and accuracy; they refer incomplete records to the person who compiled them.

In response to inquiries from law firms, insurance companies, and government agencies, technicians gather statistics and prepare periodic reports on types of diseases treated, surgery, and use of hospital beds. They also supervise medical record clerks, prepare special studies for the medical staff and tabulate data from records for research. They may take records to court.

## Working Conditions

Medical record personnel generally work a standard 40-hour week in a comfortable office environment within a hospital, nursing home, or other health care facility. Because incorrect or misplaced medical records could affect the health and well-being of a patient, close attention to detail is required. Some aspects of the job are highly repetitive.

## Employment

An estimated 20,000 medical record technicians and 35,000 clerks were employed in 1980. Although most technicians and clerks work in hospitals, a growing number are employed in nursing homes, clinics, community health centers, group practices, and health maintenance organizations. To determine liability for payment, insurance companies employ medical record technicians to collect information from patients' records. Public health departments hire technicians to supervise data collection from health care

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institutions and to assist in research to improve health care. Manufacturers of medical record systems, services, and equipment also employ medical record personnel to develop and market their products.

Some medical record technicians work for small health care facilities on a consultant basis. A few are self-employed providing medical transcription services.

## Training, Other Qualifications, and Advancement

Most employers prefer to fill technicians positions with graduates of 2-year associate degree programs accredited by the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association in collaboration with the American Medical Record Association (AMRA). In 1980, community and junior colleges offered 80 accredited programs. Required courses include biological sciences, medical terminology, medical record science, business management, and data processing. Persons with this training can take the Accredited Record Technician (ART) examination. Those who pass enter as technicians, and can often look forward to more responsible positions. In 1981, there were about 14,000 ART's.

High school graduates who have basic secretarial skills can enter the medical record field as beginning clerks. About 1 month of on-the-job training will prepare them for routine tasks that do not require much specialized skill. Although not required, high school courses in science, health, typing, mathematics, and office practice are helpful.

The AMRA offers a correspondence course in medical transcription that can be taken either as a home study program or as in-service training. The certificate given upon the successful completion of the course is helpful in applying for a job as a medical record clerk. Knowledge of medical terms and references provides a good foundation for advancement.

Medical record clerks with several years' experience can advance to the technician level upon completion of the AMRA Independent Study Program and obtaining 30 credit hours in medical record technology from an accredited college. After completing these requirements, the technician is eligible to take the ART examination for accreditation.

## Job Outlook

Employment of medical record technicians and clerks is expected to grow faster than the average for all occupations through the 1980's due to the health care needs of a growing and aging population and the increased paperwork associated with third-party payments for medical care; greater use of diagnostic procedures; and intensive review and regulation of health care providers. In addition, many openings will occur because of replacement needs.

The outlook for technicians with a 2-year associate degree or its equivalent will be excellent through the 1980's. Medical record technicians are likely to need this level of training as the documentation of medical care becomes more specialized and complex. For that reason, jobseekers without formal training may experience strong competition as medical record technicians. Opportunities for part-time work will continue.

## Earnings

Earnings of medical record clerks and technicians vary greatly according to locality. Beginning technicians averaged $12,500 in 1980, according to the limited data available. Experienced technicians in hospital record departments averaged about $15,000. Some earned over $23,000 a year.

In Federal hospitals, medical record clerks earned a beginning annual salary of about $9,800 in early 1981. Annual salaries of experienced medical record technicians ranged from about $11,000 to $19,000. In 1980, about 1,900 medical record technicians in the Federal Government averaged about $12,500 a year. Outstanding medical record technicians may work up to higher supervisory positions with corresponding pay increases, although Registered Record Administrators fill most positions.

Like most hospital employees, medical record personnel receive paid holidays and vacations, and health, insurance, and retirement benefits.

## Related Occupations

Medical record technicians and clerks perform a variety of technical and clerical duties

Medical record clerk locates patient's file.

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including verification, transcription, and filing. Other workers with similar duties include information clerks, insurance clerks, library technical assistants, medical secretaries, and medical transcriptionists.

### Sources of Additional Information

A list of approved schools for medical record technicians, facts about the correspondence courses for medical transcription and medical record personnel, and additional details about medical record technicians are available from:

American Medical Record Association, John Hancock Center, Suite 1850, 875 N. Michigan Ave., Chicago, Ill. 60611.

## Radiologic (X-ray) Technologists

(D.O.T. 078.361-018 and .362-026)

### Nature of the Work

Bone fractures, ulcers, blood clots, and brain tumors are just a few of the medical problems that involve the use of X-rays in their treatment, either for diagnosis or therapy. X-rays of the chest may also be taken during routine medical checkups to detect the presence of lung diseases in the early stages. The people who operate radiologic equipment and take X-ray pictures (also known as radiographs) are called radiologic technologists or radiographers. They usually work under the supervision of radiologists—physicians who specialize in the use of radiographs.

Radiologic technologists may work in any of the three specialties within the field of radiologic technology. The most widely known specialty is X-ray technology or radiography, taking radiographs of parts of the human body for study by a radiologist in diagnosing a patient's problem. The other two are radiation therapy technology, the use of radiation-producing machines to give therapeutic treatments recommended by radiologists; and nuclear medicine technology, the application of radioactive material to help radiologists diagnose or treat illnesses or injuries.

Before a radiologic technologist can perform any work on a patient, a physician must issue a requisition ordering the work done. Similar to prescriptions for drugs, these requisitions assure that radiologic technologists treat only people certified as needing such treatment by physicians.

Radiologic technologists prepare patients for radiologic examinations, assuring that they remove any articles of clothing, such as belt buckles or jewelry, through which X-rays cannot pass. They then position the patients, who either lie on a table or stand, so that the correct parts of the body can be radiographed, always taking care not to aggravate injuries or make the patients uncomfortable. To prevent unnecessary radiation exposure to unaffected parts, the technologist surrounds the exposed area with radiation protection devices, such as lead shields, or in some way limits the size of the X-ray beam.

After the necessary preparations, the technologist positions the radiation equipment at the correct angle and height over the appropriate area of a patient's body. Using instruments similar to a measuring tape, the technologist measures the thickness of the section to be radiographed. He or she sets the proper controls on the machine, such as those regulating exposure time, to produce radiographs of the right density, detail, and contrast. The technologist then places a properly identified X-ray film of the correct size under the part of the patient's body to be examined, and makes the exposure. Afterward, the technologist removes the film and develops it for interpretation by a radiologist. Throughout the procedure, the technologist is careful to use only as much radiation as is necessary to obtain a good diagnostic examination.

When examining a patient using fluoroscopy (watching a patient's internal body movements on a monitor or screen), the radiologic technologist prepares a solution of barium sulphate for the patient to drink. As this solution passes through the patient's digestive tract, a physician looks for diseases, injuries, or defects in the patient's digestive system. When fluoroscopic examinations are performed, whether on the digestive tract or on other parts of the body such as chest, heart, or blood vessels, the technologist assists the physician by preparing and positioning the patient, adjusting the machine, applying the correct exposure, and making any necessary follow-up radiographs.

In radiation therapy, which is mainly used for treating cancer, the radiologic technologist works under the close supervision of a radiologist. The technologist applies the correct amount of radiation for the proper period of time to the affected part of the patient's body. The technologist also must keep adequate records of the treatment and is responsible for the comfort and safety of the patient during the treatment.

In nuclear medicine, the radiologic technologist also works under the direct supervision of a radiologist. The technologist prepares solutions of radioactive material that, when swallowed by the patient or injected, are absorbed by the patient's internal organs. Because diseased tissues generally react differently from healthy ones when subjected to radioactive substances, it is possible to trace the development of disease. The technologist uses special cameras or scanners that pick up the radioactivity, and operates instruments that measure the intensity of the radioactivity.

In addition to the duties involved in operating radiologic equipment, radiologic technologists may have certain administrative tasks. Technologists prepare and maintain patients' records—keeping track of the developed film, the date it was taken, and the radiologist's diagnosis. They also may maintain files, schedule appointments, prepare work schedules and, in general, manage radiology departments or facilities.

Some radiologic technologists are full-time instructors in programs of radiologic technology.

### Working Conditions

Radiologic technologists generally work a 40-hour week that may include evening or weekend hours. Technologists are on their feet a lot and may be required to lift or turn disabled patients.

There are potential radiation hazards in this field; however, these hazards have been greatly reduced by the use of safety devices such as instruments that measure radiation exposure, lead aprons, gloves, and other shielding. In addition, technologists are trained to protect themselves and their patients.

### Employment

About 106,000 persons worked as radiologic technologists in 1980. Of these, approximately 15 percent specialized in nuclear medicine or radiation therapy technology. Hospitals employ about three-fourths of all radiologic technologists; most of the remainder work in medical and dental laboratories, and in physicians' and dentists' offices or clinics. About 3,000 radiologic technologists are employed by the Federal Government, mainly in the Veterans Administration. Some radiologic technologists work part time.

### Training, Other Qualifications, and Advancement

The general requirement for entry into this field is the completion of a formal education program in radiography. In 1981, the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association (AMA) accredited 770 programs in radiography, 148 programs in nuclear medicine technology, and 89 programs in radiation therapy technology. These programs, which are usually 2 years in length but which may be part of a 4-year degree curriculum, are offered by hospitals, medical schools, colleges, and universities. Some award a certificate; others lead to associate or bachelor's degrees. Education also may be obtained in the military services or through courses in radiologic technology offered by vocational or technical schools. While employers generally pay graduates of bachelor's degree programs the same starting salaries as those of 2- and 3-year programs, there is more potential for advancement for those holding the bachelor's degree. Those planning to be educators or administrators should pursue the bachelor's or master's degree.

All programs accept only high school graduates or the equivalent. Courses in mathematics, physics, chemistry, and biology are helpful.

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Radiologic technology programs include courses in anatomy, physiology, patient care procedures, physics, radiation protection, principles of imaging, medical terminology, positioning, medical ethics, radiobiology, and pathology.

Registration with the American Registry of Radiologic Technologists is an asset in obtaining highly skilled and specialized positions. Registration requirements include graduation from an accredited program of radiography and the satisfactory completion of a written examination. After registration, the title "Registered Technologist (ARRT)" may be used. Once registered in radiography, technologists may be certified in radiation therapy technology or nuclear medicine technology by completing an additional year of combined classroom study and clinical education in either of those disciplines.

Good health, emotional stability, and a sincere desire to work with the sick and disabled are important qualifications for this profession.

As openings occur, some experienced technologists in large radiography departments may qualify as instructors in radiologic technology or advance to supervisory radiologic technologists.

## Job Outlook

Employment in the field of radiologic technology is expected to expand faster than the average for all occupations through the 1980's, as radiologic equipment is increasingly used to diagnose and treat disease. Opportunities for nuclear medicine technologists and radiation therapy technologists should be especially favorable because of the growing use of nuclear medicine in diagnostic tests and continued research into methods of cancer treatment involving radiation therapy. While job prospects for radiographers are good, overall, there reportedly is a glut in the Northeast and a shortage in the South and the Northwest. Jobseekers should take account of these regional differences, which may persist. In addition to jobs created by increased demand for these workers, many openings will occur because of replacement needs.

Opportunities for part-time work will be best in physicians' offices and clinics where full-time radiologic services may not be required.

## Earnings

Starting salaries of radiologic technologists employed in hospitals, medical schools, and medical centers averaged about $13,600 a year in 1981, according to a national survey conducted by the University of Texas Medical Branch. Experienced radiologic technologists averaged about $17,400 a year.

Workers with more specialized skills generally earn more. Radiation therapy technologists started at about $15,300 in 1981, according to the University of Texas survey, and experienced personnel averaged $18,900 a year. Nuclear medicine technologists had average earnings of about $15,700 to start and $19,400 after several years of experience.

The Federal Government paid new graduates of CAHEA-accredited programs of radiologic technology a starting salary of about $11,000 a year in 1981. In 1980 the Federal Government paid diagnostic radiologic technologists average salaries of $14,900 a year; therapeutic radiologic technologists received $15,700 and nuclear medicine technicians, $16,200.

Sick leave, vacations, insurance, and other benefits are comparable to those covering other workers in the same organization.

## Related Occupations

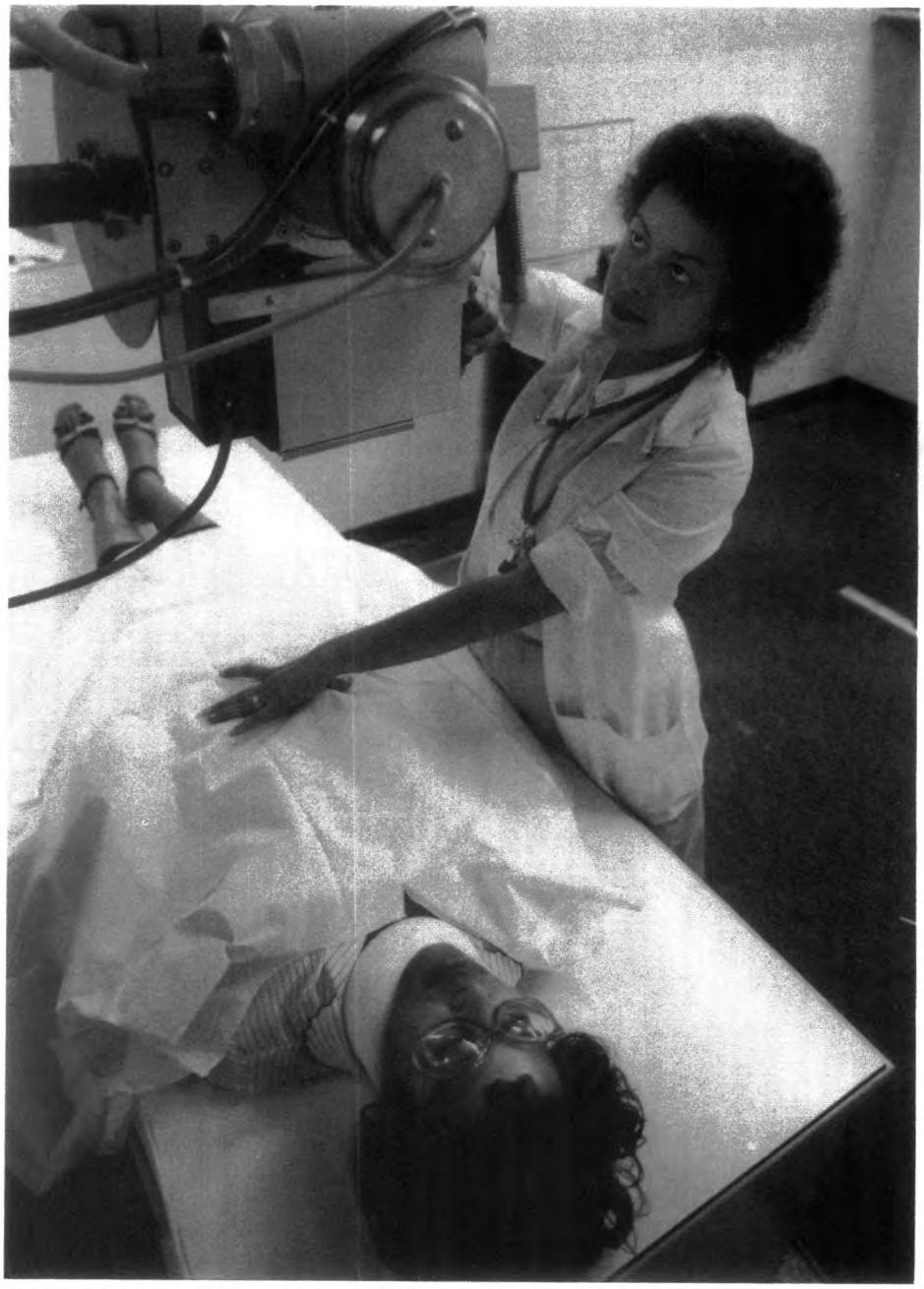
Radiologic technologists operate sophisticated technical equipment to help physicians, dentists, and other medical practitioners diagnose and treat patients. Workers in related occupations include dental hygienists, electrocardiograph technicians, electroencephalographic technologists, and medical technologists.

## Sources of Additional Information

For more information about a career in radiologic technology, write:

American Society of Radiologic Technologists, 55 E. Jackson Blvd., Chicago, Ill. 60604.

Department of Allied Health Education and Accreditation, American Medical Association, 535 N. Dearborn St., Chicago, Ill. 60610.



X-ray equipment must be positioned precisely to produce good results.

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# Surgical Technicians

(D.O.T. 079.374-022)

## Nature of the Work

Surgical technicians, occasionally called surgical technologists or operating room technicians, assist surgeons and anesthesiologists before, during, and after surgery. They work under the supervision of registered nurses or surgical technologist supervisors.

They help set up the operating room with the instruments, equipment, sterile linens, and fluids such as glucose that will be needed during an operation. Surgical technicians also may prepare patients for surgery by washing, shaving, and disinfecting body areas where the surgeon will operate. They may transport patients to the operating room and help drape and position them on the operating table.

During surgery, they pass instruments and other sterile supplies to the surgeons and the surgeons' assistants. They hold retractors, cut sutures, and help count the sponges, needles, and instruments used during the operation. Surgical technicians help prepare, care for, and dispose of specimens taken for testing during the operation and help apply dressings. They may operate sterilizers, lights, suction machines, and diagnostic equipment.

After the operation, surgical technicians help transfer patients to the recovery room and assist nurses in cleaning and stocking the operating room for the next operation.

## Working Conditions

Surgical technicians work in clean, well-lighted, cool environments. They need stamina to be on their feet the whole time they are on duty and to pay close attention to operations.

Most surgery is performed during the day, but some workplaces, such as emergency surgery units, require 24-hour coverage. A 40-hour, 5-day workweek is normal for surgical technicians, although many are required at times to be "on call" (available to work on short notice).

Surgical technicians pass instruments to the surgeon during operations.

## Employment

About 31,500 persons worked as surgical technicians in 1980. They worked in hospitals or other institutions that have operating room, delivery room, and emergency room facilities. Some surgical technicians—often called private scrubs—were employed directly by surgeons to assist them during all their operations. Most surgical technicians worked full time.

## Training, Other Qualifications, and Advancement

Currently, nearly all technicians receive their training in vocational and technical schools, hospitals, and community and junior colleges. Most training programs last from 9 months to 1 year; some community college programs, however, last 2 years and lead to an associate degree. High school graduation normally is required for entrance to these programs. Students receive classroom training as well as supervised clinical experience. Required courses include anatomy, physiology, and microbiology. Other courses include the care and safety of patients during surgery, use of anesthesia and its hazards, and nursing procedures. Students also learn how to sterilize instruments; prevent and control infection; and handle special drugs, solutions, supplies, and equipment. In 1980, there were 87 training programs accredited by the Committee on Allied Health Education and Accreditation.

Some surgical technicians are trained on the job, in programs that vary from 6 weeks to 1 year, depending on the trainee's qualifications and the objectives of the training. On-the-job training programs in many hospitals include classroom as well as clinical instruction. Applicants need a high school education or the equivalent. Some hospitals prefer applicants who have worked as nursing aides or practical nurses. Sometimes other workers in a hospital—for example, medical laboratory workers, radiology technicians, or emergency medical technicians—transfer into this occupation and are trained on the job.

Some surgical technicians receive training in the Armed Forces. Regardless of where they are trained, surgical technicians are expected to keep abreast of new developments in the field of surgery, such as laser surgery, so they will be able to work with the new equipment and procedures.

The Association of Surgical Technologists awards a certificate to surgical technicians who pass a comprehensive written examination. A Certified Surgical Technologist

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(CST) is recognized as competent in the field and may be paid a higher salary. Continuing education is required to maintain certification.

Manual dexterity is a necessity for surgical technicians because they must handle various instruments quickly. They must be conscientious, orderly, and emotionally stable. In surgery, there is very little margin for error. High school students interested in careers in this occupation are advised to take courses in health and biology.

Some surgical technicians advance to assistant operating room administrator and assistant operating room supervisor. Assistant operating room administrators deal with the administrative aspects of running an operating room, such as ordering supplies and arranging work schedules, while assistant operating room supervisors actually direct other technicians in the operating room.

## Job Outlook

Employment in this field is expected to grow faster than the average for all occupations through the 1980's. Those factors that will generate very strong demand for other health workers will also spur demand for surgical technicians—namely, population growth and the aging of the population, greater health consciousness, and widespread ability to pay for hospital and surgical care under public and private health insurance programs.

Also contributing to the growth in demand for workers in this small occupation is the practice, in some hospitals, of assigning surgical technicians a greater number of routine operating room tasks. Due to the relaxation of certain government regulations and to cost containment efforts by hospital administrators, surgical technicians are performing more and more tasks previously handled by operating room nurses.

The rate of surgery increased during the 1970's, with the most pronounced increase in operations occurring among persons 65 years of age and older. The increase in surgery among the elderly may result in part from technological advances that make surgical procedures safer and more effective than they used to be, so that the potential benefits to the elderly patient outweigh the risks. If this trend continues, demand for surgical technicians will be heightened.

In addition to job openings resulting from increased demand for surgical technicians, many openings will occur because of the need to replace workers who transfer to other kinds of work, retire, or die.

Graduates of formal training programs or surgical technicians with certification will have the best opportunities for the job openings that will occur. Persons without these qualifications can expect to face competition for jobs of their choice.

## Earnings

The average starting salary for surgical technicians was about $11,200 a year in 1981, according to a national survey conducted by the University of Texas Medical Branch at Galveston. Experienced technicians earned average salaries of approximately $14,200 annually. Surgical technicians employed by the Federal Government are classified as Operating Room Nursing Assistants. Depending on education and experience, applicants earned beginning annual salaries ranging from $8,951 to $16,826 in early 1981.

Graduates of formal training programs often earn higher salaries than workers without this training. Salaries, reflecting variations in the cost of living, also vary widely by geographic location, with those on the East and West Coasts generally higher. Surgical technicians directly employed by surgeons tend to earn more than surgical technicians employed by hospitals and similar institutions. Usually, surgical technicians earn about as much as the average for all nonsupervisory workers in private industry, except farming.

## Related Occupations

Other workers who perform medical activities under supervision are chiropractor assistants, dental assistants, electrocardiograph technicians, electroencephalographic technologists, licensed practical nurses, medical assistants, nursing aides, occupational therapy assistants, orderlies, and physical therapy aides.

## Sources of Additional Information

Additional information on a career as a surgical technician, on training programs for the occupation, and on certification is available from:

Association of Surgical Technologists, Caller No. E, Littleton, Colo. 80120.

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# Writers, Artists, and Entertainers

Creativity, imagination, and talent are prerequisites for a career as a writer, artist, or entertainer. People in these fields use a variety of media to express ideas and emotions, and to describe and interpret the human experience.

For writers, language is a "tool of the trade." They use the written or spoken word to inform, persuade, or entertain—or to express their own individuality. Poets, playwrights, lyricists, novelists, and short-story writers use language primarily for creative expression. Among those who use language to inform or persuade are journalists, speechwriters, joke writers, script writers, and copywriters. (The work of education writers, medical writers, business writers, and other technical writers is described in another section of the *Handbook*.) Some people in communications occupations do relatively little writing. Among them are editors, who revise and coordinate the work of others; proofreaders, who read and correct copy; and literary agents, who appraise and try to get manuscripts published. Radio and television announcers and interpreters rely on the spoken word to do their jobs.

People in design occupations use visual means such as light, space, color, and texture to convey feelings or create a particular effect. They need esthetic sensitivity, color sense, and talent. A fine artist creates a painting or sculpture primarily to express an emotion or idea. Applied artists create esthetically pleasing objects that serve a practical purpose. Working by hand, for the most part, they employ artistic skills and techniques to produce utilitarian objects. The design field includes people as diverse as sculptors, graphic artists, commercial artists, sign painters, illustrators, photographers, engravers, painting restorers, prop makers, silversmiths, decorators, exhibit designers, clothing designers, and furniture designers.

Performing artists express themselves through music, drama, or dance. Whereas writers and visual artists can capture a moment forever by transferring it to paper or canvas, performing artists express their creativity through movement or motion—in short, through a "performance." And just as no moment of human life can be lived again, no two live performances are ever exactly the same. Performing artists may use their talent to say something serious or profound about the human condition or they may simply provide entertainment. Because communicating with an audience is such an integral part of the performer's art, stage presence and rapport with an audience are qualities an artist must develop and refine. Actors and actresses, singers, dancers, musicians, comedians, magicians, mimes, trapeze artists, gymnasts, and figure skaters are just a few of the many different occupations in the performing arts.

In some of these occupations, particularly those in the performing arts, few jobs offer permanent employment; most are short-term engagements or contracts. With an oversupply of qualified people vying for work, many writers, artists, and entertainers have to settle for occasional or part-time employment in their chosen field. They work for pay when they can. The rest of the time, they study, practice, and take temporary jobs unrelated to their art—such as waiting on tables or sales clerking. The employment figures in the accompanying table therefore understate the total number of people who worked in these occupations at some time during the year.

**Table 1. Employment of selected writers, artists, and entertainers, 1980**

| Occupation | Employment |
|---|---|
| Designer | 165,000 |
| Instrumental musician | 138,000 |
| Commercial artist | 120,000 |
| Writer and editor[1] | 110,000 |
| Photographer | 91,000 |
| Public relations specialist | 87,000 |
| Reporter and correspondent | 57,000 |
| Radio and television announcer | 51,000 |
| Actor | 21,000 |
| Singer | 19,000 |
| Dancer | 6,500 |
| Film editor | 4,500 |
| Music director | 4,000 |

[1]Wage and salary workers only.

SOURCE: Bureau of Labor Statistics.

People who aspire to a creative career need to be realistic about their talent, for that is what counts most in getting a job or establishing a reputation. Practical experience—in local theatrical productions or on a community newspaper, for example—can help in getting started. However, even very talented people must be willing to spend years of their lives mastering a skill and then wait for a "break"—an opportunity to perform, to exhibit their work, or to have a manuscript published. Writers, artists, and entertainers need to be flexible enough to cope with job insecurity and willing to live on an irregular income. Job prospects in a number of creative occupations are described in the statements that follow.

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# Communications Occupations

The art of communications is as old as humanity. Its importance in modern society becomes apparent when you try to imagine the world without radio, television, newspapers, magazines, or books. From the earliest discoveries of papermaking techniques to today's use of computers that transmit information with hitherto unimagined speed, people have sought ways of recording the events around them and conveying the information to others. Communication is a process that begins when someone observes what is happening, analyzes and interprets that information, and transmits it to an audience through a variety of media.

The communications field includes a broad range of occupations having to do with research, writing, editing, and production; it encompasses educational, medical, business, speech, joke, screen, and fiction writing; interpreting, translating, public relations, advertising, and many other specialties. This section of the *Handbook* describes four of these occupations—newspaper reporters and correspondents, public relations workers, radio and television announcers and newscasters, and writers and editors.

Communications occupations require a broad education, with preparation either in the liberal arts and humanities or in a scientific or technical field, depending on specific career interest. The intellectual habits acquired during college are important. Acute powers of observation and the ability to think clearly and logically are necessary traits, because people in these jobs need to understand the significance of the events they observe. An excellent command of language—both written and oral—is essential. It is through appropriate choice of words or phrases that writers, for example, get the desired effect from their material. A feeling for language enables reporters and correspondents to breathe life and meaning into events that occur every day. A knack for dramatization through the spoken word makes radio and television announcers and newscasters attractive to audiences of all kinds.

In addition to a broad education and outstanding language skills, people in communications jobs may need to be very well informed about a particular subject. Depending on the job, they may need to be versed in economics, law, politics, science, engineering, computer science, education, music, or sports. They may be called upon to explain legal issues discussed by experts at an international conference on the law of the sea; national economic and political events for readers of a small-town newspaper; the latest developments in data communications technology for readers of a trade journal; or the history of jazz, classical, bluegrass, or other music featured on a radio show.

Communications workers must perform well under pressure. A reporter who submits a story late may delay a newspaper edition, resulting in a loss of newsstand sales. A television announcer who does not react quickly to emergencies on the air can cause the show's ratings to decline. A public relations worker who gives out incorrect information about a company's operations can damage its public image.

Competition for most communications jobs is keen, for the field traditionally attracts many more jobseekers than there are job openings. Some people are attracted by the glamorous image of media jobs—the opportunities to meet public figures, to appear before nationwide audiences, and to attend special events. This glamorous aspect of the job obscures the hard work most of these jobs entail. Journalists, for example, spend hours every day on the tedious but essential task of making contacts, checking facts, and following leads.

Despite the keen competition, jobs will be available through the 1980's for talented people who have acquired appropriate education and experience. For some, willingness to take a job where one is available—in a small town instead of Los Angeles or New York City—and willingness to start at the bottom may make the difference between success and failure in breaking into the field. After that, a combination of talent, education, motivation, imagination, and luck can lead to a rewarding career.

## Public Relations Workers

(D.O.T. 165.067-010 and .167-010)

### Nature of the Work

How successfully an organization presents its goals and policies to the public may affect its acceptance, prosperity, and even its continued existence. Public relations workers help businesses, governments, universities, and other organizations build and maintain a positive public reputation.

Public relations workers apply their talents and skills in many different areas. They may handle press, community, or consumer relations, political campaigning, interest-group representation, fundraising, or employee recruitment. Public relations is not only "telling the employer's story," however. Understanding the attitudes and concerns of customers, employees, and various other "publics"—and communicating this information to management to help formulate policy—is also an important part of the job. In improving communication, public relations workers promote understanding and cooperation among the diverse groups that make up our society.

Public relations departments are found in a variety of organizations, and workers must tailor their programs to an employer's particular needs. A public relations director of a college or university, for example, may spend most of the time recruiting a student body, while one in a large corporation may work with stockholders, government agencies, and community groups.

Public relations workers put together information that keeps the public aware of their organization's policies, activities, and accomplishments, and keeps management aware of public attitudes. After preparing the information, they may contact people in the media who might be interested in printing, televising, or broadcasting their material. Many radio or television announcements, special reports, newspaper items, and magazine articles start at public relations workers' desks. Sometimes the subject is a company and its policies towards its employees or its role in the community. Often the subject is a public issue, such as health, nutrition, energy, or the environment.

Public relations workers also arrange and conduct programs in which company representatives will have direct contact with the public. Such work includes setting up speaking engagements and helping prepare speeches for company officials. These workers often represent employers at community projects or occasionally may show films at school assemblies, plan conventions, or manage fundraising campaigns.

Public relations staff members in very large firms may number 200 or more, but in most firms the number is much smaller. The director of public relations, who is often a vice president of the company, may develop overall plans and policies with a top management executive. In addition, large public relations departments employ writers, research workers, and other specialists who prepare material for the different media, stockholders, and other groups the company wishes to reach.

Workers who handle publicity for an individual or direct public relations for a university, small business, or nonprofit organization may handle all aspects of the job. They contact people outside the organization, do the necessary planning and research, and prepare material for publication. These workers may combine public relations duties with advertising or sales promotion work; they may be top level officials or in more junior positions. The most skilled public relations work of making

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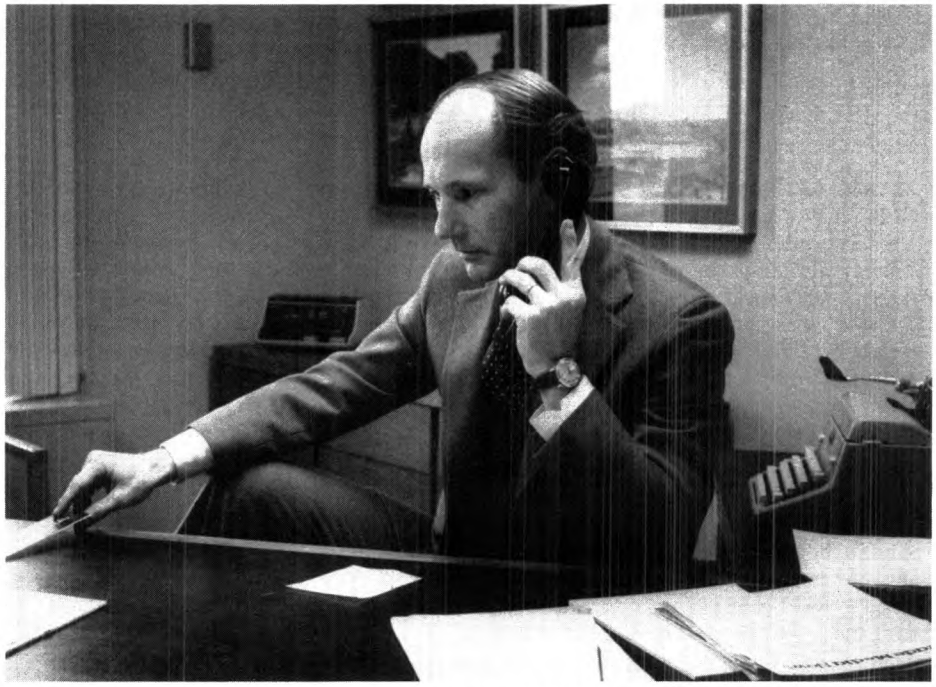

Public relations workers tailor their programs to meet the company's needs.

overall plans and maintaining contacts usually is done by the department director and highly experienced staff members.

## Working Conditions

Although the workweek for public relations staffs generally is 35 to 40 hours, schedules may be rearranged because public relations programs operate against deadlines. Preparing and delivering speeches, attending meetings and community activities, and out-of-town travel may all be a part of the public relations worker's routine. Thus, any of their regular assignments or special events may require workers to be at the job or "on call" around the clock.

## Employment

About 87,000 persons were public relations workers in 1980. Manufacturing firms, public utilities and transportation companies, insurance companies, and trade and professional associations employ many of them. A sizable number work for government agencies (the Federal Government alone employs several thousand public information specialists), or for schools, colleges, museums, and other educational, religious, and human service organizations. The rapidly expanding health field also offers opportunities for public relations work, in hospitals, pharmaceutical companies, and medical associations, for example. Many workers are employed by public relations consulting firms which furnish services to clients for a fee. Some work for advertising agencies.

Public relations workers are concentrated in large cities where press services and other communications facilities are readily available, and where many businesses and trade associations have their headquarters. Many public relations consulting firms, for example, are in New York, Los Angeles, Chicago, and Washington, D.C. A trend, however, is the dispersal of public relations jobs throughout the Nation, including smaller towns.

## Training, Other Qualifications, and Advancement

A college education combined with public relations experience is excellent preparation for public relations work. Although most beginners have a college degree in journalism, communications, or public relations, some employers prefer a background in a field related to the firm's business—science, finance, or engineering, for example. Some firms seek college graduates who have worked for the news media. In fact, many editors, reporters, and workers in closely related fields enter public relations work.

In 1980, about 90 colleges and 25 graduate schools offered degree programs or special curriculums in public relations, usually administered by the journalism or communications department. In addition, about 200 colleges offered at least one course in this field. Typical courses include public relations theory and techniques, organizational communication, public relations management and administration, and practical courses in public relations. Specialties are offered in public relations in business, government, and nonprofit organizations. Courses in advertising, journalism, business administration, political science, communications, psychology, and creative writing also help in preparing for a career in public relations. Persons who have a bachelor's degree in public relations or a related field generally enter staff positions whereas those with a graduate degree in public relations are more qualified for administrative and managerial jobs.

Extracurricular activities such as writing for a school publication or television or radio station provide valuable experience. Many schools help students gain part-time or summer internships in public relations which provide training that can help in competing for entry positions. Membership in the Public Relations Student Society of America provides an opportunity for students to exchange views with public relations workers and to make professional contacts that may be helpful later in securing a full-time job in the field. A portfolio of published articles, television or radio programs, slide presentations, and other work samples usually is an asset in finding a job.

Public relations workers spend much time gathering information. Creativity, initiative, and the ability to express thoughts clearly and simply are important to the public relations worker. Fresh ideas are so vital in public relations that some experts spend all their time developing new ideas.

People who choose public relations as a career need an outgoing personality, self-confidence, and an understanding of human psychology. They should have the enthusiasm to motivate people. The ability to be competitive but function as part of a team are important qualifications.

Public information positions in the Federal Government generally require a college degree. Media, writing, or editing experience may help in gaining such a position. Requirements for similar positions in State and local governments vary.

Some companies—particularly those with large public relations staffs—have formal training programs for new employees. In other firms, new employees work under the guidance of experienced staff members. Beginners often maintain files of material about company activities, scan newspapers and magazines for appropriate articles to clip, and assemble information for speeches and pamphlets. After gaining experience, they work on more difficult assignments, such as writing press releases, speeches, and articles for publication. In some firms, workers get all-round experience whereas in other firms they specialize.

Promotion to supervisory jobs may come as workers show they can handle more demanding and creative assignments. Some experienced public relations workers start their own consulting firms.

The Public Relations Society of America accredits public relations workers who have at least 5 years' experience in the field and have passed a comprehensive 6-hour examination (4 hours written, 2 hours oral). Employers consider professional recognition through such accreditation a sign of competence in this field.

## Job Outlook

Employment of public relations workers is expected to increase about as fast as the

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average for all occupations through the 1980's. In addition to new jobs resulting from growth in demand for these workers, openings will occur each year as workers transfer to other occupations, retire, or die.

Demand for public relations workers may slacken as employers delay expansion or cut their staff during business slowdowns, but over the long run, corporations, associations, health facilities, and other large organizations are expected to maintain or expand their public relations staffs.

Competition for beginning jobs is keen, for the glamour and excitement of public relations attract large numbers of jobseekers, including those who wish to transfer from newspaper, advertising, and closely related jobs.

Prospects for a career in public relations are best for highly qualified applicants—talented people with sound academic preparation and some media experience. Most openings for beginners are expected to occur in such organizations as corporations, public relations consulting firms, manufacturing firms, health facilities, and others.

## Earnings

Starting salaries for college graduates beginning in public relations work generally ranged from $10,000 to $13,000 a year in 1980; persons with a graduate degree often started at a higher salary.

The salaries of experienced workers generally are highest in large organizations with extensive public relations programs. According to a 1981 survey, the median annual salary of top level public relations workers was $38,000. Median annual salaries ranged from about $30,000 in hospitals to $50,000 in public relations consulting firms.

In the Federal Government, bachelor's degree holders generally started at $15,200 a year in early 1981; master's degree holders generally started at $18,600 a year; additional education or experience could qualify applicants for a higher salary. Public information specialists in the Federal Government averaged about $29,000 a year in 1980.

## Related Occupations

Public relations workers develop and distribute persuasive material in order to create a favorable public reputation. Other workers with similar jobs include fundraisers, account executives, lobbyists, promotion managers, advertising managers, and police officers involved in community relations.

## Sources of Additional Information

Career information and a list of schools accredited by the Public Relations Society of America and the Accrediting Council on Education in Journalism and Mass Communications are available for $1 from:

Career Information, Public Relations Society of America, Inc., 845 Third Ave., New York, N.Y. 10022.

Current information on the public relations field, salaries, and other items is available from:

*PR Reporter*, Dudley House, P.O. Box 600, Exeter, N.H. 03833.

Additional information on job opportunities and the public relations field in general may be purchased for $1 from:

Service Department, *Public Relations News*, 127 East 80th St., New York, N.Y. 10021.

# Radio and Television Announcers and Newscasters

(D.O.T 131.067-010, .267-010, and -018, and 159.147-010)

## Nature of the Work

Announcers and newscasters are the most familiar of the many occupations in radio and television broadcasting. At radio stations, most announcers are disc jockeys. They introduce recorded music; present news, sports, weather, and commercials; interview guests; and report on community activities and other matters of interest to the audience. Often they ''ad-lib'' much of the commentary. In small stations, they may operate the control board, sell commercial time to advertisers, and write commercial and news copy. Many radio stations also have news reporters who broadcast directly from the scene.

*Announcers* (D.O.T. 159.147-010) at television stations and large radio stations often specialize in a particular kind of programming such as sports events, general news broadcasts, or weather reports. They must be thoroughly familiar with these areas and, if a written script is required, may do the research and writing.

Television news broadcasting requires specialized ''on-camera'' personnel—anchors, television news reporters, and broadcast news analysts. In large news operations, such as those of stations in major cities or originating at a national network, all three often take part in the news broadcast.

The news anchor, or a pair of co-anchors, presents the day's important news stories. Throughout the broadcast, the anchors, sometimes called *newscasters* (D.O.T. 131.267-010), introduce films and interviews prepared by *news reporters* (D.O.T. 131.267-018) that provide in-depth information on the event being covered.

*Radio and television broadcast news analysts* (D.O.T. 131.067-010), called commentators, also discuss current news stories, but normally interpret them or discuss how specific events may affect the Nation or us personally.

Frequently a smaller television station employs only a news anchor who reads accounts of the day's stories and introduces background reports provided by the networks or by a television news service.

Announcers frequently partipate in community activities. A sports announcer, for example, might be the master of ceremonies at a touchdown club banquet or greet customers at the opening of a new sporting goods store. Some announcers become well-known and highly paid personalities.

## Working Conditions

Announcers and newscasters usually work in well-lighted, air-conditioned, soundproof studios. However, when broadcasting from the site of a fire, flood, or other emergency situation, newscasters may face some hazards. Injuries are uncommon and can be avoided by using basic safety equipment and

Radio announcers often operate the control board.

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following the instructions of fire and police officials at the scene.

Working within a tight schedule requires split-second timing and can be physically and mentally demanding. Those who enjoy the work, however, feel that the intangible rewards—creative work, many personal contacts, and the satisfaction of becoming well known in the area their station serves—far outweigh the disadvantages of irregular and often unpredictable hours, work pressures, and disrupted personal lives.

## Employment

About 51,000 persons worked as radio and television announcers and newscasters in 1980. In addition to staff announcers, some freelance announcers sell their services for individual assignments to networks and stations, or to advertising agencies and other independent producers.

## Training, Other Qualifications, and Advancement

Entry to this profession is highly competitive. While formal training in a college or technical school is valuable, station officials pay particular attention to taped auditions that present samples of an applicant's delivery and—in television—appearance and style on commercials, news, interviews, and other copy. College graduates and others hired by television stations usually start out as production assistants, researchers, or reporters and are given a chance to move into announcing if they show an aptitude for broadcasting.

Announcers must have a pleasant and well-controlled voice, good timing, and excellent pronunciation. Correct English usage and a knowledge of dramatics, sports, music, and current events improve chances for success. Good judgment and the ability to react quickly in emergencies are important because announcers may be required to "ad-lib" all or part of a show. A neat, pleasing appearance is essential, of course, for television announcers and news broadcasters. The most successful announcers combine an appealing personality with poise to win the following of large audiences.

High school courses in English, public speaking, dramatics, foreign languages, and electronics, plus sports and music hobbies, are valuable background for prospective announcers. A liberal arts education provides an excellent background for an announcer, and many universities offer courses of study in the broadcasting field. Students at these institutions also may gain valuable experience by supplementing their courses with part-time work at the campus radio station and summer work at local stations, filling in for vacationing staff members. A number of private broadcasting schools offer training in announcing.

Persons considering enrolling in any school, whether public or private, that offers training for a broadcasting career should contact the personnel managers of radio and television stations, broadcasting trade organizations, and the Better Business Bureau in their area to determine the school's performance in producing suitably trained candidates.

Announcers generally get their first broadcasting jobs in a small station. Because announcers in small radio stations sometimes operate transmitters, prospective announcers often obtain a Federal Communications Commission (FCC) restricted radiotelephone operator permit. This qualifies them to become involved in the routine operation of radio transmitters and makes them much more useful to these stations. Of course, employers may be even more attracted to those who have a general radiotelephone operator license. (For additional information on licensure, see the statement on broadcast technicians elsewhere in the *Handbook*.

Announcers usually work in several different stations in the course of their careers. After acquiring experience at a station in a small community, an ambitious and talented announcer may move to a better paying job in a large city. An announcer also may advance by hosting a regular program as a disc jockey, sportscaster, or other specialist. In the national networks, competition for jobs is particularly intense, and announcers often must be college graduates and have several years of successful announcing experience before they are given an audition.

## Job Outlook

Competition for beginning jobs as announcers and newscasters will be very keen through the 1980's. The broadcasting field will continue to attract many more jobseekers than there are jobs. It will be easier to get a job in radio than in television because more radio stations hire beginners. These jobs generally will be located in small stations, however, and the pay will be relatively low. Because competition for ratings is so intense in major metropolitan areas, large radio and television stations will continue to seek highly experienced announcers and newscasters who have proven that they can attract a large audience.

Employment of announcers and newscasters is expected to increase faster than the average for all occupations through the 1980's as new radio and television stations are licensed. Additional jobs will become available as more cable television stations begin their own programming. Employment of radio announcers may not keep pace with the increase in the number of stations, however, because of the increased use of automatic programming equipment. Some jobs in this relatively small occupation will result from the need to replace experienced announcers who die, retire, or leave the labor force for other reasons. Over the years, employment in this occupation has not been significantly affected by downturns in the economy. When poor business conditions and decreasing advertising revenues have forced employment reductions, radio and television stations generally have cut back the number of production and "behind-the-scenes" workers, rather than reduce the number of announcers and broadcasters.

## Earnings

In 1980, announcers generally started at $150 to $160 a week in small stations, according to the limited information available. Earnings among experienced announcers were much higher, and some well-known announcers in major metropolitan areas earned extremely high salaries. As a rule, salaries increase with the size of the community and the station, and salaries in television are higher than those in radio. Announcers employed by educational broadcasting stations generally earn less than those who work for commercial stations.

Most announcers in large stations work a 40-hour week and receive overtime pay for additional hours. Many announcers in small stations work a considerable amount of overtime. Working hours consist of both time on the air and time spent in preparing for broadcasts. Evening, night, weekend, and holiday duty occurs frequently since many stations broadcast 24 hours a day, 7 days a week.

## Related Occupations

The success of radio and television announcers and news broadcasters is largely dependent upon their ability to speak effectively to their audiences. Others for whom oral communications skills are vital are interpreters, narrators, sales workers, public relations workers, and dramatic and comedy performers.

## Sources of Additional Information

For a list of schools that offer programs and courses in broadcasting, contact:

Broadcast Education Association, 1771 N St. NW., Washington, D.C. 20036.

For information on FCC licensure, write to:

Federal Communications Commission, 1919 M St. NW., Washington, D.C. 20552.

# Reporters and Correspondents

(D.O.T. 131.267-018)

## Nature of the Work

Reporters and correspondents play an important role in American society. They gather information and write stories that inform us about local, State, and national events; present differing points of view on current issues; and monitor the actions of public officials and others who exercise power. In covering a story, they may do background research, review public records, and interview a variety of people. As a rule, reporters take notes or use a tape recorder while collecting facts and write their stories upon returning to the office. In order to meet deadlines, however, they sometimes telephone their information or stories to

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rewriters who write or transcribe the stories for them.

Most reporters and correspondents work for newspapers. Large daily papers frequently assign teams of reporters to investigate social, economic, or political conditions and other reporters to specific locations or "beats," such as police stations or the courts, to gather news originating in these places. General assignment reporters write up local news, such as a story about a school board meeting or an obituary of a community leader. Many newspaper, magazine, and wire service reporters with a background or interest in a particular subject analyze and interpret the news in specialized fields such as medicine, politics, foreign affairs, sports, fashion, art, theater, consumer affairs, travel, finance, social events, science, education, business, labor, and religion. Critics review restaurants and movies as well as literary, artistic, and musical works and live performances while editorial writers present viewpoints on topics of public interest.

Newspapers, magazines, and wire services frequently station reporters known as correspondents in large cities as well as in other countries to prepare stories on major news events occurring in these locations. Reporters on small newspapers cover all aspects of local news, and also may take photographs, write headlines, lay out pages, edit wire service copy, and write editorials. On some small weeklies, they also may solicit advertisements, sell subscriptions, and perform general office work.

Reporters spend much of their time checking out leads.

## Working Conditions

The work of reporters and correspondents is usually hectic. They are under pressure to meet deadlines and most work under the most trying conditions. In the office, they must contend with loud conversation and the confusion of people constantly on the go. Some assignments covering wars, political uprisings, fires, floods, and other events may be dangerous.

Working hours vary by type of publication. Reporters working for morning papers usually work from late afternoon until midnight. Those with afternoon or evening papers generally work from early morning until early or midafternoon. Although magazine reporters often can schedule their work during the day, all reporters may have to change their work hours to meet a deadline or to update an earlier report because of late breaking developments. Their work may demand long hours, irregular schedules, and some travel. Foreign correspondents often work late at night to send news to papers in time for printing.

## Employment

About 57,000 persons worked as reporters and correspondents in 1980. Four of every five worked for newspapers, either large city daily papers or daily or weekly papers in suburban communities and small towns. Others worked for magazines, wire services, and in radio and television broadcasting.

## Training, Other Qualifications, and Advancement

Most editors prefer graduates who have a degree in journalism, which includes training in the liberal arts along with professional training in journalism. Some editors consider a liberal arts degree sufficient. A few prefer applicants who have a bachelor's degree in liberal arts and a master's degree in journalism. High school courses that are important include English, journalism, social studies, and typing.

In 1980, the vast majority of journalism graduates who landed jobs on newspapers, magazines, or with news wire services prepared specifically for news work by majoring in news-editorial journalism.

Bachelor's degree programs in journalism are available in about 240 colleges. About three-fourths of the courses in a typical undergraduate journalism curriculum are in liberal arts. Required journalism courses include introductory mass media, basic reporting and copy editing, history of journalism, and press law and ethics. Other journalism courses are elected in the student's specific area of interest.

About 350 community and junior colleges offer journalism courses or programs. Credit earned may be transferable to 4-year college programs in journalism. Some junior colleges also offer programs especially designed to prepare the student directly for employment as a general assignment reporter. However, such graduates find it increasingly difficult to compete with graduates of 4-year programs. The Armed Forces also provide some training in journalism.

A master's degree in journalism was offered by about 70 schools in 1980; about 20 schools offered the Ph.D. degree. Some graduate programs are intended primarily as preparation for news careers, while others concentrate on preparing journalism teachers, researchers and theorists, and advertising and public relations workers.

Liberal arts courses useful to persons preparing for a reporting career include English courses with an emphasis on writing, sociology, political science, economics, history, psychology, computer science, business, and speech. The ability to read and speak a foreign language also is desirable. Those who aspire to reporting in a specialized field—science or finance, for example—should concentrate on course work in those subject areas.

Typing skill is essential because reporters type their own news stories. Also, familiarity with a typewriter keyboard is important because a growing number of reporters work where computerized word-processing equipment is used for writing and editing stories. The ability to take shorthand also is useful.

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Often, a knowledge of news photography is valuable.

The Newspaper Fund and individual newspapers and magazines offer summer internships that provide college students with an opportunity to perform a variety of basic reporting or editing duties. Experience acquired through such internships helps immeasurably in job placement after graduation. In addition, more than 3,000 journalism scholarships, fellowships, and assistantships were awarded to college journalism students by universities, newspapers, foundations, and professional organizations in 1979.

News reporting involves a great deal of responsibility, because what a reporter writes frequently influences the opinion of the reading public. Reporters should be dedicated to serving the public's need for accurate and impartial news. Although reporters work as part of a team, they have an opportunity for self-expression. The ability to present facts and opinions clearly and succinctly is essential for success in this field. Accuracy and objectivity are equally important, because untrue or libelous statements can lead to costly lawsuits.

Important personal characteristics include a "nose for news," curiosity, persistence, initiative, poise, resourcefulness, an accurate memory, and the physical stamina and emotional stability to deal with pressing deadlines, irregular hours, and sometimes dangerous assignments. Because some assignments lead reporters to unfamiliar places, they must be able to adapt to strange surroundings and feel at ease around a variety of people.

Some who compete for full-time reporter jobs find it is helpful to have had experience as a "stringer"—a part-time reporter who covers the news in a particular area of the community and is paid on the basis of the stories printed. High school and college newspapers, and church or community newsletters also provide writing and editing experience that may be helpful in getting a job.

Most beginners start with small publications as general assignment reporters or copy editors. A few outstanding journalism graduates are hired by large city papers and national magazines, but this is the exception rather than the rule. Large employers generally require several years of reporting experience.

Beginning reporters are assigned duties such as reporting on civic and club meetings, summarizing speeches, writing obituaries, interviewing important visitors to the community, and covering police court proceedings. As they gain experience, they may report more important events, cover an assigned "beat," or specialize in a particular field.

Reporters may advance to reporting for larger papers or press services. However, competition for such positions is keen and news executives receive many applications from highly qualified reporters every year. Some experienced reporters become columnists, correspondents, editorial writers, editors, or top executives; these positions represent the top of the field and competition for them is extremely keen. Other reporters transfer to related fields such as public relations or preparing copy for radio and television news programs.

## Job Outlook

Employment of reporters and correspondents is expected to grow about as fast as the average for all occupations through the 1980's. This growth will come about because of an increase in the number of smalltown and suburban daily and weekly newspapers. For the most part, little or no increase is anticipated in the number of big city dailies, although some of them may increase the size of their reporting staffs. Magazines and radio and television broadcasting should continue to provide a significant number of jobs, but major news magazines and large radio and television stations primarily seek only experienced reporters. In addition to the openings that result from employment growth, openings will arise from the need to replace reporters who die, retire, transfer to other fields of work, or leave the profession for other reasons.

Overall, graduates who have majored in news-editorial journalism and completed an internship while in school should have the best prospects for reporting jobs. Most editors prefer to hire the top graduates of accredited programs. Talented writers who can handle highly specialized scientific or technical subjects will be at an advantage on the job market. Small newspapers often look for beginning reporters who are acquainted with the community and who can help with photography and other aspects of newspaper production. Persons without at least a bachelor's degree in journalism will face increasingly stiff competition for entry level positions.

Newspapers and magazines located in small towns and suburban areas are expected to continue to offer the most opportunities for beginning reporters. Journalism graduates who are willing to relocate and start at relatively low salaries are likely to find reporting jobs on these newspapers. Openings arise on small publications as reporters gain experience and move up to editorial positions, or transfer to reporting jobs on larger newspapers and magazines.

Competition for reporting jobs on large metropolitan newspapers and national magazines will be keen. Most of these employers require experience and do not ordinarily hire new graduates. Sometimes, however, new graduates find jobs on major publications because they have credentials in an area for which the paper has a pressing need. Occasionally, the experience and contacts gained through an internship program or summer job lead to a reporting job directly after graduation.

Because enrollments in journalism education programs are expected to rise through the 1980's, college teaching opportunities are expected to be good for qualified applicants—generally, Ph.D.'s with practical reporting experience. Some highly qualified reporters with a master's degree will find teaching positions in journalism departments of colleges and junior colleges. This favorable outlook for journalism educators contrasts with the generally bleak prospect for college faculty in many other academic disciplines.

Employment of reporters and correspondents generally is not cut back sharply during slack economic periods, but when business conditions force publishers to reduce spending, new hiring may be temporarily slowed or even halted.

College graduates who have majored in journalism also have the background for work in such closely related fields as advertising and public relations. Every year, a substantial number of journalism graduates take media jobs in these fields. Other graduates accept sales, managerial, and other nonmedia positions, while still others continue their training and then find jobs in fields such as law, business, public administration, and political science.

## Earnings

Reporters working for daily newspapers and magazines having contracts negotiated by the Newspaper Guild had starting salaries ranging from about $165 to $587 a week in 1980. The majority earned between $225 and $300 a week.

Reporters having 4 or 5 years of experience averaged $406 a week in early 1980. Virtually all experienced reporters earned over $300 a week while the top contractual salary was $616 a week. A number of top reporters on big city dailies earned even more, on the basis of merit. In general, earnings of reporters are above the average earnings of nonsupervisory workers in private industry, except farming.

Most newspaper reporters generally work a 5-day, 35- or 40-hour week and receive extra pay for overtime work. Benefits may vary widely according to length of service and the size and location of the newspapers. Most reporters, however, receive benefits such as paid vacations, group insurance, and pension plans.

## Related Occupations

Reporters and correspondents must write clearly and effectively to succeed in their profession. Others for whom writing ability is essential include technical writers, advertising copy writers, public relations workers, educational writers, fiction writers, biographers, screen writers, and editors.

## Sources of Additional Information

Career information, including pamphlets entitled "Your Future in Daily Newspapers" and "Facts about Newspapers," is available from:

American Newspaper Publishers Association Foundation, The Newspaper Center, Box 17407, Dulles International Airport, Washington, D.C. 20041.

Information on careers in journalism, col-

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leges and universities that offer degree programs in journalism or communications, and journalism scholarships and internships may be obtained from:

The Newspaper Fund, Inc., P.O. Box 300, Princeton, N.J. 08540.

For a list of junior and community colleges offering programs in journalism, contact:

National Community College Journalism Association, San Antonio College, 1300 San Pedro Avenue, San Antonio, Tex. 78284.

Information on union wage rates for newspaper and magazine reporters is available from:

The Newspaper Guild, Research and Information Department, 1125 15th St. NW., Washington, D.C. 20005.

For a list of schools with accredited programs in their journalism departments, send a stamped, self-addressed envelope to:

Accrediting Council on Education for Journalism and Mass Communication, School of Journalism, University of Missouri, Columbia, Mo. 65205.

For general information about careers in journalism, contact:

Association For Education in Journalism, University of South Carolina School of Journalism, Columbia, S.C. 29208.

"Careers in Communications," a booklet providing information on opportunities for women in newspaper reporting and other communications fields is available from:

Women In Communications, Inc., P.O. Box 9561, Austin, Tex. 78766.

Names and locations of newspapers and a list of schools and departments of journalism are published in the *Editor and Publisher International Year Book*, available in most public libraries and newspaper offices.

# Writers and Editors

(D.O.T. 131 except .067-030 and -034; .087-014; .267-010, -018, -022, and -026; 132.)

## Nature of the Work

Writers and editors communicate through the written word. Writers develop original fiction and nonfiction prose for books, magazines, trade journals, newspapers, technical studies and reports, company newsletters, radio and television broadcasts and advertisements. Editors supervise writers and select and prepare material for publication or broadcasting. Two specialized types of writers—technical writers and newspaper reporters and correspondents—are described elsewhere in the *Handbook*.

Writers start by selecting a topic or being assigned one by an editor. They then gather information on the topic through personal observation, library research, and interviews. Sometimes the information gathered may cause writers to change the focus to a related topic that is more interesting. From the information gathered they select and organize the material to be used, and finally put it into words that will convey it to the reader with the desired effect. Writers often revise or rewrite sections searching for the best organization of the material or just the right phrasing. Newswriters—writers employed by newspapers and radio and television news departments—write news items for inclusion in newspapers or news broadcasts. Starting with information supplied by reporters or wire services, they write news stories or scripts for newscasters.

Editors frequently do some writing and almost always do much rewriting, but their primary duties are to plan the contents of the publication and to supervise its preparation. They decide what will appeal to readers, assign topics to writers, and oversee the production of the book, magazine, or newspaper. In small organizations, one editor has full responsibility for the publication. In larger ones, an executive editor oversees the activities of associate or assistant editors who have responsibility for particular subjects, such as fiction, international news, or sports. Administrative duties of editors include hiring and firing writers and other employees, planning budgets, negotiating contracts with freelance writers, and general managerial duties. In broadcasting companies, program directors have responsibilities comparable to those of editors.

Editors and program directors are often helped by assistants who may have the title of assistant editor, editorial assistant, copy editor, or production assistant. Many of these assistants hold entry level jobs. They review copy for errors in grammar, punctuation, and spelling. They check manuscripts for readability, style, and agreement with editorial policy. They add and rearrange sentences to improve clarity or delete incorrect and unnecessary material. Editorial assistants also perform research for writers and verify facts, dates, and statistics. They may help prepare material for publication or broadcast by arranging page layouts of articles, photographs, and advertising or by planning the use of films. They may also compose headlines, prepare copy for typesetters, and proofread the printer's galleys. Some editorial assistants read and evaluate manuscripts submitted by freelance writers or answer letters about published or broadcast material. Production assistants clip stories that come over the wire services' printers, answer phones, and make copies of material for newswriters, editors, and program directors.

## Working Conditions

Working conditions for writers and editors vary with the kind of publication they work on and the kind of articles they produce.

Editorial assistants prepare material for publication by arranging page layouts.

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Most work independently. Some work in comfortable, private offices; others work in noisy rooms filled with the sound of typing and other writers tracking down information over the telephone. The search for information sometimes requires travel and visits to diverse workplaces, such as factories, offices, the ballpark, or the theater, but many have to be content with telephone interviews and the library.

The workweek usually runs 35 to 40 hours. Night and weekend work is required of those who prepare morning or weekend publications and broadcasts. Some workers must also put in overtime to meet deadlines or to cover a late-developing story. The more frequently the publication is issued, the more frequent the deadlines and the greater the pressure to meet them.

## Employment

In 1980, 110,000 people earned salaries as writers or editors. Nearly 40 percent worked for newspapers, magazines, and book publishers. Substantial numbers also worked on journals and newsletters published by business and non-profit organizations, such as professional associations, labor unions, and religious organizations. Others wrote and edited advertising and public relations materials for advertising agencies, public relations firms, and large corporations. Some also worked in radio and television broadcasting; others developed publications for Federal, State, and local governments.

Persons who write and edit for major book publishers, magazines, broadcasting companies, advertising agencies and public relations firms, and the Federal Government tended to be concentrated in large cities like New York, Chicago, Los Angeles, Boston, Philadelphia, San Francisco, and Washington, D.C. More widely dispersed throughout the country, on the other hand, were those who work for newspapers; corporations; and professional, religious, business, technical, and trade union magazines or journals.

Thousands of other persons worked as freelancers—earning some income from their articles, books and, less commonly, television and movie scripts. Most supported themselves primarily with income from other sources.

## Training, Other Qualifications, and Advancement

Formal educational requirements for writing and editing jobs vary. A college degree is required by many employers, but there is little agreement as to the preferred major. Some employers look for a broad liberal arts background or a major in literature, history, philosophy, or one of the social sciences. Others prefer to hire people with degrees in communications or journalism. Some jobs, such as technical writing, require a degree in a specialized field—engineering, business, or one of the sciences, for example.

Whatever their educational backgrounds, writers and editors must be able to express ideas clearly and logically. Creativity, intellectual curiosity, a broad range of knowledge, self-motivation, and perseverance are also valuable assets. For some jobs, the ability to concentrate amid confusion and to produce under pressure is essential. Since writing requires research, writers must be familiar with research techniques. Editors must have good judgment in deciding what material to accept and what to reject. They must also have tact and the ability to guide and encourage others in their work.

All prospective writers need practical writing experience. High school and college newspapers, literary magazines, and small community newspapers and radio stations all provide valuable—but sometimes unpaid—experience. Many magazines, newspapers, and radio and TV stations have summer internships in which students can learn about the publishing and broadcasting business. Interns might run errands, answer phones, conduct some research and interviews, or even write short pieces, depending on the employer.

Advancement for writers and editors depends, in part, on the size of the organization for which they work. In small firms, beginning writers and editors may do a little bit of everything, not only working as editorial or production assistants but also writing or editing material right away. They often advance by moving to other firms, so turnover among beginning writers and editors is high. In larger firms, jobs are usually structured more formally. Persons in entry level positions generally do research, fact checking, or copy editing. They take on full-scale writing or editing duties less rapidly than do the employees of small companies. Advancement comes as they are assigned more important articles to write or edit.

## Job Outlook

Employment of writers and editors is expected to increase about as fast as the average for all occupations through the 1980's. Growth in the employment of writers and editors will largely depend on the growth of the industries that employ these workers. Employment of salaried writers and editors by newspapers, periodicals, book publishers, and nonprofit organizations—including research agencies and religious, business, professional, and civic associations—is expected to increase with growing demand for their publications. Growth of advertising and public relations agencies should also be a source of new jobs. Besides jobs created by increased demand for writers and editors, many job openings will occur as experienced workers in this field transfer to other occupations, retire, or die.

Employment in radio and television broadcasting is expected to increase much faster than the average through the 1980's. In the past decade, there has been a huge upsurge in the number of FM radio and educational TV stations. In the future, increased use of cable television and of television sets that receive news directly from servicing companies may have an important impact on the employment of writers and editors.

Each year, thousands of young people with college degrees in English, journalism, communications, and the liberal arts seek writing and editing jobs. Many end up in other occupations because the number of people qualified to work as writers and editors greatly exceeds the number of positions available, despite the high turnover in these occupations. Throughout the 1980's, the outlook for writing and editing jobs is expected to continue to be keenly competitive. Opportunities will be best in firms that prepare business and trade publications and in technical writing. Persons considering careers in writing and editing should keep their options open because the job market in this field is very competitive. Academic preparation in a field unrelated to writing may prove useful to some people, either to qualify them as writers specializing in that field, or to qualify them for a job in the field itself in the event that they are unable to get a salaried writing job.

## Earnings

In 1980, beginning salaries for writers and editorial assistants ranged from $12,000 to $16,000 annually, according to surveys by the American Management Associations. Salaries for experienced writers and researchers generally ranged between $18,000 and $26,000 a year, depending on their qualifications and the size of the publication on which they work. Experienced editors generally earned between $17,000 and $31,000 a year; supervisory editors, $22,000 to $34,000 a year.

Senior editors on large circulation newspapers and magazines earn over $50,000 per year. Many writers and editors supplement their salaried income by doing freelance work.

Writers and editors employed by the Federal Government earned an average of $24,000 a year in 1980.

## Related Occupations

Writers and editors communicate ideas and information to individuals for their education and entertainment. Other communications occupations include technical writers, newspaper reporters and correspondents, radio and television announcers, advertising and public relations workers, and teachers of journalism.

## Sources of Additional Information

For information on writing and editing careers in the field of communications, contact:

Women in Communications, Inc., P.O. Box 9561, Austin, Texas 78766.

For a journalism career and scholarship guide, contact:

The Newspaper Fund, Inc., P.O. Box 300, Princeton, N.J. 08540.

For information on college internships in magazine editing, contact:

American Society of Magazine Editors, 575 Lexington Ave., New York, N.Y. 10022.

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# Design Occupations

People in design occupations are applied artists. They design products, plan and execute window and interior displays, illustrate publications, and compose and take photographs. They are concerned with the function and appearance of articles for everyday use as well as with the places in which people live and work. Good design means creating objects and environments which not only serve their purpose well but are also pleasing to the eye. Pleasant surroundings can boost our spirits and productivity, and products and packaging that are designed for "eye appeal" are likely to attract buyers. Manufacturers, retail and wholesale trade establishments, advertising agencies, printing and publishing firms, and television and motion picture studios employ these people. Many are self-employed, working in their own art studios.

Applied artists design a variety of products, settings, and advertisements as well as oversee the work of other artists or craft workers who produce or install them. *Commercial artists* design newspaper and TV advertisements as well as catalog, books, and instructional materials; *Photographers* take pictures to convey an idea or tell a story; *industrial designers* develop functional, attractive articles for everyday use; *display workers* design and install exhibits of clothing, accessories, and furniture; *interior designers and decorators* arrange furnishings and spaces in homes, stores, and offices; *floral designers* create floral arrangements to express the thought and sentiments of the sender.

Design careers require varying levels of training. While floral designers often learn their duties on the job and may not even need a high school diploma, industrial designers as a rule must complete 4 or more years of college. Persons with appropriate experience and a major in engineering, architecture, and fine arts may also gain entry to this field. A liberal arts education and training in painting, sculpture, and architecture are important for commercial artists. Although not a requirement, formal training is becoming increasingly important for interior designers. This is available in 3-year professional school programs of interior design as well as in 4-year college and university programs. The curriculum for these occupations includes principles of design, art and art history, mechanical and architectural drawing, painting, architecture, and basic engineering. Although a college degree is not necessary for photographers and display workers, 2-year and 4-year institutions of higher education offer courses that are useful for these occupations. Regardless of the amount of formal training required, people in the design field must be creative, imaginative, persistent, and able to communicate ideas visually.

Artistic talent is crucial in all the design occupations. People in this field need strong color sense, an eye for detail, a sense of balance and proportion, and sensitivity to beauty. In finding a job, good portfolio—a collection of examples of a person's best work—is sometime more important than formal education.

Because styles and tastes in art and fashion change with almost breathtaking speed, people in this field need to be versatile and open to new ideas and influences. Creative work can be frustrating, even discouraging, during periods when new ideas don't come—or when the designer's ideas clash with those of a client. Sometimes a concept or layout has to be changed to accommodate a client. Dealing with clients calls for tact and sound professional judgment.

Problem-solving skills and the ability to work independently are important traits for people in the design field. It is the designer's job to come up with a solution to a client's design problem that is both esthetic and practical. These workers need self-discipline to start projects on their own, and to budget their time in order to meet deadlines. Business acumen and sales ability are important for the many people in this field who are freelancers or run their own businesses.

The statements that follow discuss design occupations in more detail. Several other jobs that require design skills are described elsewhere in the *Handbook*. See the statements on urban and regional planners, engineers, architects, and landscape architects.

## Commercial and Graphic Artists and Designers

(D.O.T. 017.281-034; 141.031-010, .061, .067-010, .081; 142.031-010, .061-014, .081-018; 149.031-010; 962.381-018; 970.381-018, .661-014, and .681-026)

### Nature of the Work

Some professional artists are painters, who produce works of art intended to be displayed in museums, art galleries, and homes. Most, however, are commercial and graphic artists and designers, who illustrate and design the flood of magazine, newspaper, and TV advertisements as well as catalogs, brochures, instruction manuals, technical literature, book and record jackets, textiles, and many other items requiring visual appeal.

The field of commercial art, also called graphic art or design, is very broad and includes some activities only loosely related to what is usually thought of as art. Most people in the field work in either illustration or design.

**Illustrators** paint or draw pictures. Many do a variety of illustration work while others are specialists.

*Fashion illustrators* (D.O.T. 141.061-014) specialize in stylish and fashionable illustrations of the latest in women's and men's clothing. This specialty is perhaps the most glamorous and "artistic" commercial art specialty.

While fashion illustrators can be interpretive in their drawings, *technical illustrators* (D.O.T. 017.281-034) strive for accuracy. Technical illustrators make drawings of technical products for instruction manuals, sales brochures, and advertisements. They often work closely with engineers and technicians and must understand the workings of the items they draw.

*Medical illustrators* (D.O.T. 141.061-026) combine an interest in art with knowledge of the biological sciences. They draw illustrations of parts of the human body. Their work is used in medical textbooks and other publications, for research purposes, and in lectures and presentations.

*Cartoonists* (D.O.T. 141.061-010) form another illustration specialty. They draw political cartoons, newspaper comic strips, and comic books. Some cartoonists work with others who create the idea or story and write the captions. Most cartoonists, however, must have humorous, critical, or dramatic talents in addition to drawing talent.

*Animators* (D.O.T. 141.081-010) draw the large series of pictures which, when transferred to film, form the animated cartoons seen in the movies and on TV. Animators are employed almost exclusively in the motion picture industry, which produces animated cartoons for TV and the movies.

Some illustrators draw "story boards" for TV commercials. Story boards present TV commercials in a series of scenes in much the same way as a newspaper comic strip tells a story, so that the advertising agency and the client (the company doing the advertising) can evaluate the effectiveness of proposed commercials. Story boards may also serve as guides to placement of actors and cameras and to other details during the production of the commercials. Some illustrators draw for children's books; others specialize in book and record jacket illustration.

**Designers.** Many in art-related jobs do little or no drawing, but instead create or supervise the creation of effective visual impressions of advertisements and industrial products.

*Art directors* (D.O.T. 141.031-010) decide the art, design, photography, and type

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Commercial artist preparing a "mechanical" which will be used for printing a pamphlet.

style that go into published materials and TV advertisements. In many organizations, an executive or managing art director is in charge of a number of art directors who are assigned to many individual projects or advertising accounts.

Art directors create a visual effect that will sell a product. They may design and illustrate advertisements or other artwork themselves, or direct and supervise others in this work. Art directors are usually well paid and have commensurate responsibility. Their job is considered the top commercial art-related job, although some regard art directors as managers or administrators rather than artists.

*Letterers* (D.O.T. 970.661-014) select the most appropriate type based on their knowledge of a wide variety of styles. They either hand-letter headlines and other important text or they use available printing type. Since most type styles can be supplied by printers, the use of hand lettering is diminishing. However, knowledge of lettering is important for almost all graphic and commercial art jobs.

*Graphic designer* (D.O.T. 141.061-018) is a general title that can describe anyone from a designer specializing in corporate symbols and letterheads to a designer of a variety of visual items such as signs, posters, and magazine covers. *Package designers* (D.O.T. 142.081-018) create package designs that catch the consumer's eye, using their knowledge of the technical aspects of packaging as well as a keen marketing sense. *Book designers* design book jackets, select type for the text, and prepare the layout of photographs and artwork. *Textile designers* (D.O.T. 142.061-014) design the prints and graphic designs woven into or printed on textiles, combining a knowledge of textile production with a keen sense of good graphic design.

The lowest level art positions in an advertising agency or art studio are *layout* or *paste-up workers*. These jobs are often entry level positions and may not be considered art jobs. However, they provide experience for aspiring commercial artists. Layout workers take the elements of the advertisement (photographs, illustrations, and text) and carefully position them according to the art director's instructions. This "mechanical," as it is called, is used by the magazine or newspaper as a guide in printing the advertisement.

## Working Conditions

Many commercial artists are full-time salaried employees. They work in offices and studios and usually have hours and working conditions similar to those of other office workers.

But a large proportion of commercial artists, especially illustrators, are freelancers. Freelancers do individual projects for whoever wishes to use their services. Until an illustrator develops a reputation and a regular clientele, he or she will not receive a steady income. Much effort often must be expended on selling potential customers on the quality of one's work and in acquiring experience and a reputation. Freelancers can set their own hours and working conditions. However, both freelance and salaried commercial artists must frequently meet tight deadlines which necessitate long hours of work until the project is complete.

## Employment

In 1980, about 120,000 people worked as commercial and graphic artists and designers. The majority were employed by the advertising industry, either directly or indirectly as freelancers, or by graphic art studios which do much of their work for advertising agencies.

The publishing industry also employs many commercial artists. Other industries also employ commercial artists in in-house advertising and graphic arts departments.

Commercial and graphic artists are concentrated in larger cities. New York City has by far the largest concentration because it is the center of the advertising and publishing industries. Chicago and Los Angeles also have many artists. However, there are commercial and graphic artists employed almost everywhere except in very small towns and rural areas.

## Training, Other Qualifications, and Advancement

In the graphic arts field, demonstrated ability rather than evidence of appropriate training or other qualifications is all that is needed for success. The device used by almost all in the graphic arts field to gain employment or freelance work is the "portfolio," a collection of examples of the artist's best work. Evidence of appropriate talent and flair shown in the portfolio is the most important factor used by art directors and others in deciding whether to hire or contract out work to an artist. In theory, a person with a good portfolio but no training or experience could succeed in graphic arts. In reality, to put together a successful portfolio, most aspiring graphic artists must acquire skills in a post-secondary art school—usually in a 4-year program. A bachelor's degree in fine arts is less useful because many of the technical skills necessary are not taught and the emphasis is on art for its own sake rather than on art for marketing and other purposes. There also are many other kinds of art schools, some with 2-year associate degree programs, as well as vocational education programs. Some of these provide the technical skills necessary to get a beginning job but may not give the background necessary for advancement. However, there are always exceptions to any rule in this field. What really counts is talent, and some with little or no formal training have been very successful in commercial art.

Persons hired in advertising agencies or graphic arts studios often start with relatively routine work such as paste-ups or mechanicals. While doing this work, however, they may observe and practice their skills on the side. Those with talent may advance to assistant art director and then to art director. Others may gain enough skill to succeed as a freelancer or may prefer to specialize in an area such as lettering. Many freelancers get started by working part time as a freelancer while continuing to hold a full-time job. Others have enough talent and confidence in their ability to start out as a freelancer immediately after they graduate from art school. Many actually freelance part time while still in school, an excellent way to develop experience and a portfolio of published work.

Advancement for the freelancer consists of developing a set of clients who regularly contract for work at good rates. Some successful freelancers develop wide recognition

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for their skill in specialties such as children's book illustration or high fashion illustration. These freelancers earn high incomes and can pick and choose the type of work they will do.

## Job Outlook

The commercial art and graphics field has a glamorous and exciting image. Because few formal entry qualifications exist, there is a large supply of people who at least partially qualify for entry. Consequently, keen competition exists for salaried jobs and freelance work. Many commercial artists are only able to find enough freelance work to occupy themselves part time. Many freelancers are also forced to charge very low prices for their work until they acquire experience and a good reputation. Despite an oversupply of those seeking commercial art jobs, those with outstanding talent are eagerly sought.

Employment of commercial and graphic artists is expected to grow through the 1980's as advertising and design continue to expand with the economy. However, the supply of those seeking entry to this field will probably continue to exceed requirements. Those with above-average talent and a mastery of graphic art skills will continue to be in demand.

## Earnings

Earnings for commercial artists vary widely. Those in entry level paste-up or layout jobs may make little more than the minimum wage. Art directors, by contrast, can make $30,000-$40,000 or more per year. Earnings for freelancers vary even more. Those struggling to gain experience and a reputation may sometimes be forced to charge what amounts to less than the minimum wage for their work. Well-established freelancers are able to make a very comfortable living. Freelancers of course do not receive any of the usual fringe benefits such as health insurance or retirement benefits that salaried employees receive.

In 1980, Federal Government employees in art-related jobs earned an average salary of about $20,700 per year.

## Related Occupations

Many occupations in the advertising industry such as account executives or creative directors are related to commercial and graphic art and design. Workers in other occupations in which visual art skills are applied are architects, display workers, floral designers, industrial designers, interior designers, landscape architects, and photographers. The various printing occupations are related to graphic art, as are teachers of art and design.

## Sources of Additional Information

For additional information on graphic artists, write to:

The Graphic Artists Guild, 30 East 20th St., Room 405, New York, N.Y. 10003.

The National Art Education Association, 1916 Association Dr., Reston, Va. 22091.

# Display Workers

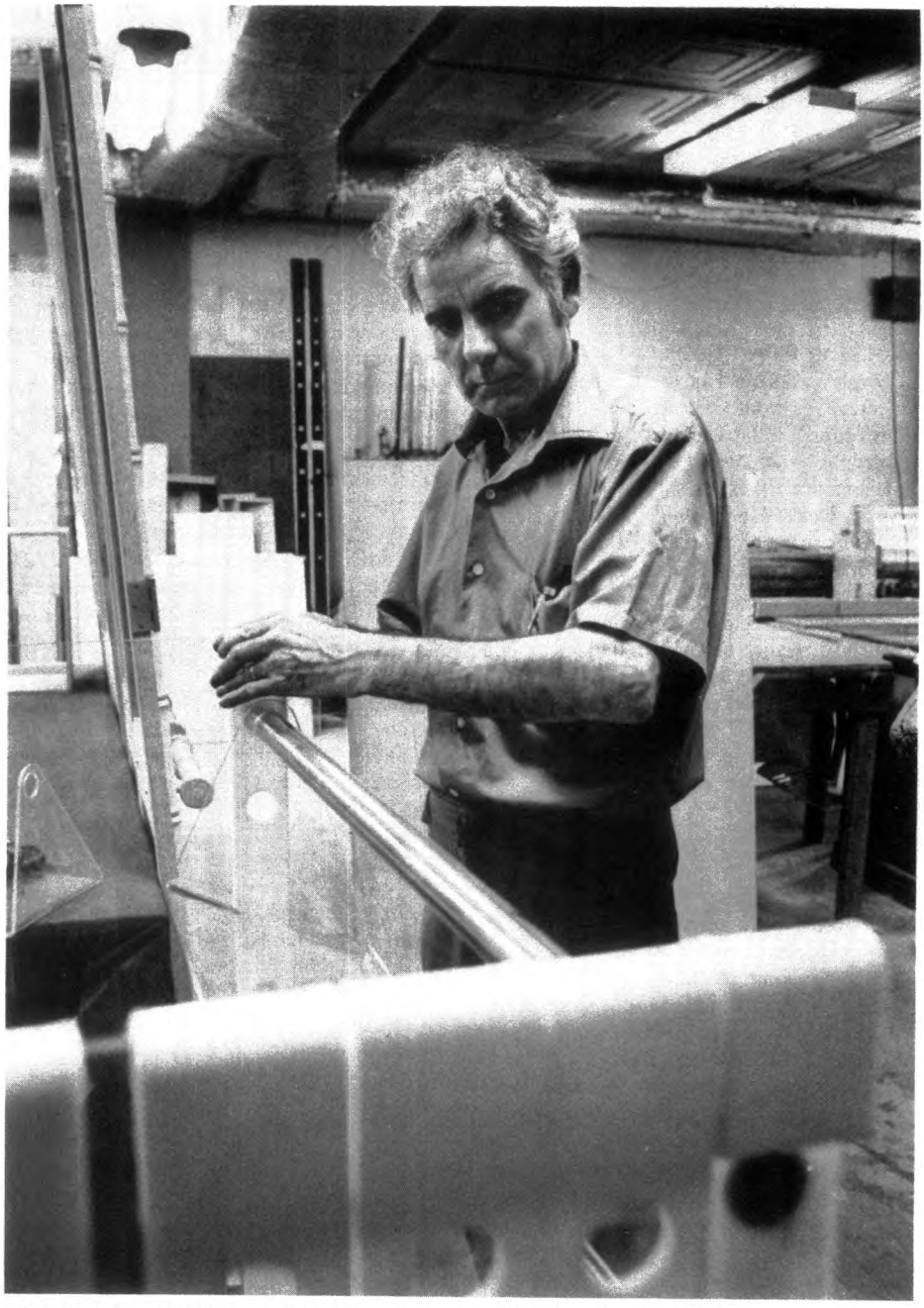
(D.O.T. 298.081-010, .381-010)

## Nature of the Work

It happens every day: A shopper browsing through a clothing store notices an attractive outfit on a mannequin and decides to buy one just like it. A fishing enthusiast sees a display of angling equipment in a store window, goes in, and buys a new reel. Eye-catching displays in store windows and stores attract customers and encourage them to buy. Knowing how effective this form of advertising can be, some stores allot a large share of their publicity budget to displays.

*Merchandise displayers* (D.O.T. 298.081-010) create a visual background or a "buying" atmosphere through displaying merchandise. They design and install displays of clothing, accessories, and furniture in store windows, showcases, and on the sales floor. Their aim is to develop attractive and attention-getting ways of showing merchandise. Display workers known as *model dressers* specialize in dressing mannequins. Others are designated according to the area they decorate as *showcase trimmers* or *window dressers*.

Display workers use imagination and creative ability as well as knowledge of color harmony, composition, and other fundamentals of art and interior design when creating an overall setting to show off the merchandise. They may, for example, choose a theme—a beach setting to advertise bathing suits or surfing equipment—and design a colorful display around this theme. After the design has been approved by the display



Display worker constructs a prop to be used in a department store window.

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manager, display workers obtain the props and other necessary accessories. Their craft skills come into play at this time.

Display workers often construct many of the props themselves using hammers, saws, spray guns, and other tools. They may be assisted in these tasks by carpenters, painters or by store maintenance workers. Sometimes display workers use merchandise from other store departments as props. They may also use old props designed for previous displays, or order props from firms that specialize in them. The display workers install background settings such as wallpaper and carpeting, lighting equipment, and the props. Every 7 to 14 days, they dismantle and replace old displays with new ones.

In large stores that employ many display workers, each may specialize in an activity such as carpentry, painting, making signs, or setting up interior or window displays. A display director usually supervises and coordinates the activities of all departments and confers with store, merchandising, and sales managers to select merchandise for promotion and plan displays.

*Commercial decorators* (D.O.T. 298.381-010) are often employed by the promoters of trade exhibitions to prepare and install decorations and displays for trade and industrial shows, exhibitions, festivals, and other special events.

## Working Conditions

Display personnel have the opportunity to do creative work. Creating a design and transforming it into reality can be a highly rewarding experience.

Display workers usually work 35 to 40 hours a week. During busy seasons, such as before Christmas and Easter, they may work overtime, nights, and weekends to prepare special displays.

Construction and installation of displays frequently require prolonged standing, bending, stooping, and working in awkward positions. Display workers risk injury from falls off ladders, from contact with sharp or rough materials, and from the use of power tools, but serious injuries are uncommon.

## Employment

About 26,000 persons were employed as display workers in 1980. Most worked in retail stores such as department and clothing stores. Display workers were employed in many other kinds of retail stores, however, including variety, drug, and shoe stores and in book and gift shops. Others worked on a freelance basis or for design firms that handle professional window dressing for small stores.

Geographically, employment is distributed much like the Nation's population, with most jobs in large towns and cities.

## Training, Other Qualifications, and Advancement

Most display workers learn their trade through informal on-the-job training. Beginners are hired as helpers to dismantle displays, carry props, and do other routine tasks. Gradually, they are assigned more difficult tasks such as building props, and, if they show artistic talent, planning simple designs. Training time varies, however, depending on the beginner's ability and the variety and complexity of displays.

A high school diploma is the minimum requirement for most beginning jobs. Courses that provide helpful training for display work include art, woodworking, mechanical drawing, and merchandising. Some employers seek applicants who have completed college courses in art, interior decorating, fashion design, advertising, or related subjects.

Display work is included in the curriculum of many of the distributive education and marketing programs taught in high schools and community and junior colleges. Fashion merchandising schools and fine arts institutes also offer courses useful to display workers.

Creative ability, imagination, manual dexterity, and mechanical aptitude are among the most important personal qualifications needed in this field. Good physical condition and agility are needed to carry equipment, climb ladders, and work in close quarters without upsetting props.

Advancement may take several forms. A display worker with supervisory ability might become display director in a large store, and then progress to sales promotion director or head of store planning.

Freelance work is another avenue of advancement. Relatively little financial investment is needed to start a freelance business in the design field. However, this is a highly competitive area and business is likely to be slow until the firm's reputation is established. For this reason, some workers moonlight until they have enough clients for full-time work.

The display worker's skills also could lead to jobs in other art-related occupations such as interior decoration or photography. These occupations, however, require additional formal training.

## Job Outlook

Employment of display workers is expected to grow about as fast as the average for all occupations through the 1980's. Employment growth will reflect the expansion of retail trade as well as the growing popularity of visual merchandising, which involves extensive use of merchandise to decorate the store and frequent changes of displays. In addition to the jobs resulting from employment growth, openings will arise as experienced workers transfer to other occupations, retire, or die. Employment of display workers may be affected by economic fluctuations, however, since their jobs depend on the volume of sales in retail establishments and people tend to buy less during economic downturns.

Employment opportunities will continue to be concentrated in large stores, most of which are located in metropolitan areas.

## Earnings

Among large employers, wages for beginners ranged from $3.20 to $4.50 an hour in 1980. Beginners who have completed college courses in art, interior decorating, or related subjects generally received the higher salaries. Experienced display workers' salaries ranged from $160 to $400 a week, depending largely on experience and ability. Most display managers earned between $15,000 and $25,000 a year. Experienced managers in large metropolitan department stores may earn considerably more.

The earnings of freelancers depend on their talent and reputation on the number and kinds of stores or clients they service, and on the amount of time they work. Many highly skilled freelancers earn more than $25,000 a year.

## Related Occupations

Display workers draw, paint, design, and construct displays that promote the sales of merchandise. An ability to recognize different shades and colors and the ability to form a mental image of how shapes and forms can be combined and arranged in artistic ways are some of the skills needed to succeed in this kind of work. Others whose work requires these skills include exhibit designers, floral designers, graphic designers, interior designers, and set designers.

## Sources of Additional Information

Details on career opportunities can be obtained from local retailers, such as department stores, and from local offices of the State employment service.

# Floral Designers

(D.O.T. 142.081-010)

## Nature of the Work

Floral designers arrange flowers and foliage into a design to express the sentiments of the sender. In performing their work, floral designers combine knowledge of flower and plant forms and floral design techniques with their creativity to produce floral and plant gifts, decorations, and tributes.

Designers must know the names, care and handling techniques, and lasting characteristics of flowers, and information about the growing of flowering plants. They must also know the seasonal availability and prices of flower and plant materials.

In any given day, designers may receive such orders as decorative flowering plants, bouquets, corsages, centerpieces, funeral flowers, and artificial or dried-flower arrangements. Special events such as weddings

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and parties also provide floral designers with opportunities to display their creative talents. Designers play a very important role in the success of flower shops; beautifully designed floral arrangements invite customers to browse and buy.

Designers usually work from a written order sometimes indicating occasion, customer preference for color and type of flower, price, and the date, time, and place the arrangement or plant is to be delivered. Customers sometimes leave the choice of flowers, color, and design to the discretion of the designer.

For example, a funeral order may read "easel spray of red and white flowers." For the foundation, the designer may attach a styrofoam base near the top of a three-legged wire stand. Appropriate flowers such as white gladiolas and red carnations are selected from the floral refrigerator. The price of the order and the cost of the flowers determine the number and variety of flowers used. The flowers are cut to the needed length and usually wired for security. Stems may be strengthened with wooden sticks for easy insertion into the base.

To provide a background for the flowers, the designer may insert leafy branches, such as chamaedorea or fern, into the base. If gladiolas are used, they are spaced so that the tips of the flowers approximate an oval or diamond shape. When carnations are used, they are placed among the gladiolas to provide contrasting form, color harmony, and depth. A bow may be placed at the focal point of the spray, and additional foliage added to conceal construction. The spray is ready for delivery. All this takes only about 15 minutes for an experienced floral designer.

Floral designers also may help customers select flowers, plants, gifts, and floral accessories. During slack periods, designers sometimes decorate flowering plants, arrange planters and terrariums, prepare accessories and containers for future use, prepare window displays, or take inventory. The variety of duties performed by a floral designer depends on the size of the shop and the number of designers employed. Self-employed floral designers must combine skills of artistic design with business management and sales ability. In a one-person operation the florist must do everything from growing flowers to keeping books. He or she must know flowers, how to buy wisely, how to use past records for future orders, and how to care for flowers and plants to avoid loss. The success of a business will in part depend on the owner's ability to get along with other business people and customers.

## Working Conditions

Floral designers often stand for long periods. Work areas are often cool and humid to preserve the flowers. Designers are exposed to sudden temperature changes when entering or leaving storage refrigerators. In general, however, florist shops are clean and well ventilated and provide a pleasant work atmosphere.

Floral designer assembles loose flowers into an artistic arrangement.

## Employment

An estimated 56,000 floral designers were employed in 1980. Nearly all designers work in the retail flower shops common to large cities, suburban shopping centers, and small towns. Geographically, employment is distributed much the same as the population. Many shops are small and employ only one or two floral designers; many designers manage their own stores.

## Training, Other Qualifications, and Advancement

An increasing number of prospective entrants take courses in floral design offered in adult education programs, junior colleges, and commercial floral design schools. Longer programs, some offering a college degree in floriculture and floristry provide training in flower marketing and shop management. Formal training in floral design usually gives a prospective designer an advantage in obtaining a job over applicants who have no training. However, since speed and creative ability are the most important elements in successful floral designing, talent and training acquired through actual work experience also is valuable.

Many people who want to become designers are trained on the job by the owner, manager or an experienced floral designer. Initially,they may copy simple arrangements that use one type of flower. As they gain experience, they do original designs required for special orders. Usually a person can become a fully qualified floral designer after 2 years of on-the-job training.

Good color vision, manual dexterity, stamina, and the ability to arrange various shapes and colors in attractive patterns are the primary qualifications for this occupation. A high school diploma is desirable, although not essential. Applicants must be able to write legibly and to do the simple arithmetic necessary to write up bills. High school courses in art, business arithmetic, bookkeeping, selling techniques, and other business subjects are helpful. Experience gained by working part time in a flower shop while still in school is very helpful.

Floral designers with supervisory ability may advance to manager or design supervisors in large flower shops. Those who have the necessary funds may open their own shops.

## Job Outlook

Employment of floral designers is expected to grow more slowly than the average for all occupations through the 1980's as fresh flower sales decline and a shift from floral arrangements to loose flowers and nonperishable decorations continues. In addition to job openings created by employment growth, many openings will arise as designers transfer to other occupations retire, or die.

Employment of floral designers is affected by ups and downs in the economy. During a recession, those working in shops in areas of high unemployment may be laid off.

## Earnings

Experienced designers usually earned between $5 and $10 an hour in 1980, according to the limited information available. Inexperienced floral designers generally earned a little more than the minimum wage. Earnings of self-employed florists vary greatly, depending on the profitability of their business.

In small shops, floral designers usually work 8 hours a day, Monday through Saturday. In many large shops, designers who

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work Saturday get a day off during the week. Designers generally work long hours before holidays such as Easter, Mother's Day, Valentine's Day, and Christmas when the demand for flowers and plants is great.

Most designers receive holiday and vacation pay. Those working in small shops usually receive limited fringe benefits. Some employers pay part of the cost of group life and health insurance but few contribute to retirement plans other than social security. Floral designers in a few cities are members of the United Food and Commercial Workers International Union.

## Related Occupations

Floral designers need to have an eye for detail and a sense of balance, color, proportion, and esthetic appeal. Others whose jobs require similar aptitudes include display workers, graphic designers, interior designers, set designers, artists, and art teachers.

## Sources of Additional Information

For additional information about careers in floral design and addresses of schools offering courses in this field, write to:

Society of American Florists, 901 N. Washington St., Alexandria, Va. 22314.

# Industrial Designers

(D.O.T. 142.061-026)

## Nature of the Work

A consumer wants a product—whether it's a home appliance, a new car, or a ballpoint pen—to be as attractive, functional, safe, and easy to use as possible. Industrial designers combine artistic talent with knowledge of product use, marketing, materials, and methods of production to create the best and most appealing design and thereby make the product competitive with similar goods in the marketplace.

As the first step in their work, industrial designers gather information on how the product compares with competing products, the needs of the user of the product, fashion trends, and effects of the product on its environment. After initial research, industrial designers sketch several designs and consult with a development team of product planners, engineers, production specialists, and sales and market research personnel about the feasibility of each idea. They consider such factors as performance, quality, visual appeal, convenience, utility, safety, maintenance, and total cost to the manufacturer, distributor, retailer and consumer.

After company product managers select the most suitable product design alternatives, the industrial designer or a professional modeler makes a model. After consumer testing and necessary revisions, a final or working model is made, usually of the material to be used in the finished product. The approved model is then engineered, tooled, and manufactured.

Although most industrial designers are product designers, others are involved in different facets of design. To create favorable public images for companies and for government services, some designers develop trademarks or symbols that appear on products, advertising, brochures, and stationery. Some design containers and packages that both protect and promote their contents. Others prepare small display exhibits or the entire presentation for industrial fairs.

Corporate designers usually work only on products made by their employer. This may involve filling day-to-day design needs of the company or long-range planning of new products. Independent designers who serve more than one industrial firm, either as freelance designers or as members of consulting firms, often plan and design a great variety of products.

Industrial designers aim for reliability, safety, ease of maintainence, and visual appeal.

## Working Conditions

Industrial designers generally work in clean, well-lighted, and well-ventilated rooms. They normally work a 5-day, 35- to 40-hour week, but occasionally, work extra hours to meet deadlines.

Designers may face frustration at times when their designs are rejected. Independent consultants, who are paid by the assignment, are under pressure to please clients and to find new ones to maintain workloads.

## Employment

An estimated 13,000 persons were employed as industrial designers in 1980. Most worked for large manufacturing companies designing consumer or industrial products or for design consulting firms. Others did free-

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lance work, or were on the staffs of architectural and interior design firms. A few taught industrial design in colleges, universities, and art schools.

Most industrial design consultants work in large cities such as New York, Chicago, Los Angeles, and San Francisco. Designers with industrial firms usually work in or near the manufacturing plants of their companies, often in medium-sized cities.

## Training, Other Qualifications, and Advancement

A course of study in industrial design in an art school, university, or technical college is the usual requirement for entering this field. Most large manufacturing firms hire only those who have a bachelor's degree in industrial design. Persons majoring in engineering, architecture, and fine arts may qualify if they have artistic talent and experience in industrial design.

In 1980, 28 colleges and art schools offered programs in industrial design that were either accredited by the National Association of Schools of Art or recognized by the Industrial Designers Society of America. Most of these schools award a 4 or 5 year bachelor's degree in industrial design or art. A few also offer a master's degree in industrial design. A master's degree is usually needed for teaching, but not for private practice or work in manufacturing companies. Many schools do not allow formal entry into bachelor's degree program until a student has successfully finished a year of basic art and design courses. Applicants may be required to submit sketches and other examples of their artistic ability.

Many industrial design programs in colleges or universities include courses in basic engineering, art, physical, natural and behavioral sciences, and marketing and business administration. Art schools generally stress a strong foundation in art. In most programs, students spend much time in the lab designing three dimensional objects. In studio courses, students make models with clay, wood, plaster, and other easily worked materials. In schools that have the necessary machinery, students make models of their designs while learning to use metalworking and woodworking tools and machinery. Students also take courses in drawing, drafting, and other visual communications skills. Many schools also offer courses in computer aided design.

Industrial designers must have creative talent, drawing skills, the ability to translate abstract ideas into tangible designs, and the foresight to anticipate consumer needs. They must understand and meet the needs and tastes of the public, rather than design only to suit their own artistic needs. Designers should expect their ideas to be modified and resubmitted many times before final acceptance. Since industrial designers must cooperate with product planners, engineers and other staff members, the ability to work and communicate with others is essential. A sound understanding of marketing, sales, and other business practices is especially important to those interested in consulting work.

Applicants for jobs should assemble a "portfolio" of photographs, drawings and sketches to demonstrate their creativity and ability to communicate ideas.

Beginning industrial designers frequently do simple assignments. As they gain experience, they work on their own, and may become supervisors with major responsibility for the design of a product or group of products. Those who have an established reputation and the necessary funds may start their own consulting firms.

## Job Outlook

Employment in this relatively small occupation is expected to grow more slowly than the average for all occupations through the 1980's. Although the trend in recent years has been away from frequent redesign of household products, automobiles, and industrial equipment, continued emphasis on quality, ecology, product safety, new products such as business and office machines as well as an emphasis on design of high technology products in medicine should increase demand for industrial designers. In addition to openings resulting from increased demand for industrial designers, some employment opportunities will arise each year as designers die, retire, or transfer to other fields.

Demand for industrial designers may fluctuate over short-run periods. During economic downturns when the market for new products is dampened, the need for these workers also tends to decline. New graduates may face stiff competition during such times.

## Earnings

Salaries for inexperienced industrial designers with a bachelor's degree generally averaged about $15,000 a year in 1980, according to a recent survey. Staff or junior designers with 2 years of experience averaged $18,000 a year. Salaries of those with many years of experience were higher, depending upon individual talent and the size and type of firm. In addition to the basic salary, industrial designers may receive bonuses based on the quality of work, special projects, or sales.

Earnings of industrial designers who own their consulting firms fluctuate greatly, but in general tend to be higher than the average earnings of salaried industrial designers.

## Related Occupations

Workers in other occupations who design or arrange objects and materials to optimize their appearance, function, and value include architects, clothes designers, commercial artists, display designers, floral designers, interior designers, and set designers.

## Sources of Additional Information

A brochure about careers and a list of schools offering courses and degrees in industrial design are available for $2 from:

Industrial Designers Society of America, 1717 N St. NW., Washington, D.C. 20036.

# Interior Designers

(D.O.T. 142.051-014)

## Nature of the Work

Interior designers make our living, working, and playing areas more attractive and functional. They plan and supervise the design and arrangement of building interiors and furnishings. They work on private homes or commercial establishments like offices, restaurants, clubs, and theaters.

When planning a space and its furnishings, a designer first considers its purpose, the needs of its occupants, and the client's budget and taste. For instance, a designer might consider a very expensive couch which would easily soil for a living room but not for a recreation room, or a doctor's reception room.

Next, the designer prepares color sketches and detailed scaled plans of the finished interior. He or she shows these, along with color charts, photographs of furniture and accessories, samples of upholstery and drapery materials, and wall coverings to the client. The designer also provides estimates of the cost of everything required to complete the project. Sometimes clients do not approve the plans, in which case the designer must revise them.

Once the client approves both the plans and the cost, the designer orders the furnishings, contracts for and supervises the work of painters, floor finishers, carpet layers, and other craft workers, and makes sure the furnishings are installed and arranged according to plan.

Designers who work in large department and furniture stores advise customers on decorating and design plans. Although their principal function is to sell the store's merchandise, they may suggest furnishings from other sources when essential to the customer's plans. Department store designers also frequently advise the store's buyers and executives about style and color trends in interior furnishings.

Some interior designers work on large projects such as the interiors of entire office buildings, hospitals, and libraries. Generally, they plan the complete layout of rooms without changes to the structure of the building. They also may redesign or renovate the interiors of old buildings. In these cases, they confer with architects to make sure that plans comply with building codes. Some interior designers also design the furniture and accessories to be used, and then arrange for their manufacture. A few design the interiors of ships and aircraft or stage sets used for motion pictures or television.

Regardless of where they are working, designers must deal with paperwork; they must place orders, figure estimates, and maintain

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Interior designer coordinates wall and floor coverings and furniture.

records of where to purchase hundreds of different types of furnishings. Handling business matters such as these requires accuracy and close attention to detail.

## Working Conditions

Designers' work hours are sometimes long and irregular. They usually adjust their workday to suit their clients, meeting with them during the evening or on weekends when necessary. They may transact business in clients' homes or offices, in their own offices, or in a variety of other locations.

Designers generally work at their own pace in a quiet atmosphere, but sometimes the work is hectic. Most design jobs require coordinating the activities of building trades workers and suppliers, which is not an easy task when deadlines are tight and delivery problems crop up. The ability to handle people and many details, even under pressure, is very important.

## Employment

An estimated 35,000 persons worked as interior designers in 1980, primarily in large cities.

Most designers work for design firms. They work independently with the firm's clients or serve as assistants to senior designers. Others work as members of design teams, sometimes with architects and engineers.

Some interior designers work in large department or furniture stores. Others work for hotel and restaurant chains, builders, government agencies, and other organizations that do a great deal of building or renovation. Some work for architects, furniture suppliers, antique dealers, and furniture and textile manufacturers. Interior designers also work for magazines that feature articles on home furnishings.

Some experienced interior designers with business ability run their own firms, either alone or in partnership with other designers.

## Training, Other Qualifications, and Advancement

Formal training in interior design is increasingly important for entry into this field. Most architectural firms, well-established design firms, department and furniture stores, and other major employers accept only professionally trained people for beginning jobs. Training is available in 3-year certificate or diploma programs in professional schools of interior design, and in 4-year college or university programs in interior design. The curriculum usually includes principles of design, history of art, freehand and mechanical drawing or architectural drafting, painting, architecture as it relates to interiors, design of furniture and exhibits, and study of materials, such as woods, plastics, metals, and fabrics. Knowledge of furnishings, art pieces, and antiques is important. In addition, courses in business and management are valuable. Keeping up with new fibers, finishes, and materials as well as government regulations, flammability standards, and product performance is also essential.

Membership in the American Society of Interior Design (ASID) or in the Institute of Business Designers is a recognized mark of achievement in this profession. Membership usually requires the completion of 3 or 4 years of post high school education in design, at least 2 years of practical experience in the field, and completion of a written and design-problem examination. The 10-hour design-problem test covers space allocation and furniture selection and arrangement, as well as lighting and electrical plans.

Beginners usually need 1 to 3 years of on-the-job training before they advance to designer. They may act as receptionists, shoppers who match materials or find accessories, stockroom assistants, salespersons, assistant decorators, and junior designers. Beginners who do not get trainee jobs often sell furniture, fabric, lamps, or other interior furnishings in department or furniture stores to gain experience in dealing with customers and to become familiar with the merchandise. There is no guarantee, however, that this experience will result in a job in design, although it could lead to a career in merchandising.

Experienced designers may advance to design department head or to other supervisory positions in department stores or in large design firms. If they have the necessary funds and aptitude for business, they may open their own firms.

Although formal education is important, talented individuals with a background in art or architecture and environmental design, as well as imagination, creativity, and an ability to sell themselves, may find work as freelancers.

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Artistic talent is crucial for interior designers. People in this field need a strong color sense, an eye for detail, a sense of balance and proportion and an ability to think in 3-dimension. Because styles and tastes in art and fashion change quickly, people in this field need to be versatile and alert to new ideas and trends.

A successful designer must also be well-organized and good at handling details. The ability to work well with people is very important, for a designer must be able to deal effectively with clients, suppliers, and craft workers such as carpenters, electricians, and plumbers.

## Job Outlook

Persons seeking beginning jobs in interior design are expected to face competition through the 1980's. Interior design is a competitive field that requires talent, training, and business ability, and many applicants vie for the better jobs. Talented college graduates who major in interior design and graduates of professional schools of interior design will find the best opportunities for employment. Those with less talent or without formal training will find it increasingly difficult to enter this field.

Employment of interior designers is expected to increase about as fast as the average for all occupations through the 1980's. Growth in population, personal incomes, and expenditures for home and office furnishings and the increasing use of design services in commercial establishments should result in a greater demand for these workers. In addition to new jobs, openings will be created by the need to replace designers who transfer to other occupations, retire, or die.

Department and furniture stores are expected to employ an increasing number of designers as their share in the growing volume of design work for commercial establishments and public buildings increases. Interior design firms also are expected to continue to expand.

Employment of interior designers, however, is sensitive to changes in general economic conditions because some people forego design services when the economy slows down.

## Earnings

Beginners usually are paid a straight salary plus a small commission. Starting salaries range from the minimum wage plus a small commission to a fixed salary of about $8,000 to $14,000 a year. Firms in large metropolitan areas usually pay the highest salaries. Corporations pay higher starting salaries than architectural or space design firms.

Some experienced interior designers are paid straight salaries, some receive salaries plus commissions based on the value of their sales, and others work entirely on commissions.

Incomes of moderately experienced designers were generally between $15,000 and $25,000 a year in 1980 while very talented designers and those in senior positions ranged from $30,000 to about $50,000 annually. A few nationally recognized professionals earned well over $50,000 annually.

The earnings of self-employed designers vary widely, depending on the volume of business, their professional reputation, the economic level of their clients, and their own business competence.

## Related Occupations

Interior designers must have artistic talent, be creative, and have good color sense and good taste. Other occupations that require similar skills include exhibit designers, set designers, fabric and wallpaper designers, furniture designers, display workers, floral designers, photographers, and manufacturers' sales workers who handle interior furnishings.

## Sources of Additional Information

For information about careers in interior design and a list of schools offering programs in this field, contact:

American Society of Interior Design, 730 Fifth Ave., New York, N.Y. 10019.

Career information is also available from:

Institute of Business Designers, National Headquarters, 1155 Merchandise Mart, Chicago, Ill. 60654.

# Photographers

(D.O.T. 143 except .062-022)

## Nature of the Work

Photographers use their cameras and film to portray people, places, and events much as a writer uses words. Those who are skillful can capture the personality of individuals or the mood of scenes which they photograph. Photographers specializing in scientific, medical, or engineering photography expose worlds normally hidden from our view.

Although their subject matter varies widely, all photographers use the same basic equipment. The most important tool, of course, is the camera, and most photographers own several. Unlike snapshot cameras, which have a lens permanently attached to the camera body, the professionals' cameras are generally constructed to use a variety of lenses designed for close-up, medium-range, or distance photography.

Besides cameras and lenses, photographers use a variety of film and colored filters to obtain the desired effect under different lighting conditions. When taking pictures indoors or after dark, they may use electronic flash units, floodlights, reflectors, and other special lighting equipment.

Some photographers develop and print their own photographs in the darkroom and may enlarge or otherwise alter the basic image. Many photographers send their work to laboratories for processing.

Because the procedures involved in still photography are quite different from those in motion picture photography, many photographers specialize in one or the other. However, the demand is growing for photographers who have training in both areas.

In addition to the skilled use of cameras and accessories, photographers must be able to compose their pictures with creativity and to recognize a potentially good photograph.

*Still photographers* (D.O.T. 143.062-030) may specialize in a particular type of photography, such as portrait, fashion, or industrial work. Portrait photographers take pictures of individuals or groups of persons and often work in their own studios. For special events, such as weddings or christenings, however, they take photographs in churches and homes. Portrait photographers in small studios, like other small business owners, frequently handle all aspects of their business. They arrange for advertising and schedule appointments; set and adjust equipment before taking the pictures; develop and retouch negatives; develop proofs; and mount and frame pictures. They also purchase supplies and take care of the billing and recordkeeping.

Industrial photographers take pictures of a wide range of subjects including livestock, manufactured articles, buildings, and groups of people. They frequently do photography for catalogs. Companies use their work in publications to report to stockholders or to advertise company products or services. To create attractive, eye-catching promotional pictures, advertising photographers must command a broad array of photographic techniques. Industrial photographers also photograph groups of people for employee news magazines or take motion pictures of workers operating equipment and machinery for management's use in analyzing production or work methods.

*Scientific photographers* (D.O.T. 143.062) and *biological photographers* (D.O.T. 143.362-010) provide illustrations and documentation for scientific publications and research reports. The photographs and slides they produce are also used for teaching purposes. These photographers usually specialize in a particular field, such as engineering, aerodynamics, medicine, biology, or chemistry. Some design photographic equipment for use as a research tool. For example, medical researchers often use ultraviolet and infrared photography, fluorescence, and X-rays to obtain information not visible under normal conditions. Time-lapse photography (where time is stretched or condensed), photomicrography (where the subject of the photography may be magnified 50 or 70 times or more), and photogrammetry (surveying an area using aerial photography) are other special techniques.

*Photojournalists* (D.O.T. 143.062-034) photograph newsworthy events, places, people, and things for publications such as newspapers and magazines or for television news shows. They may also prepare educational slides, filmstrips, and movies.

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Photojournalists take pictures to illustrate magazine and newspaper articles.

## Working Conditions

Working conditions for photographers vary. Those who have salaried jobs usually work a 5-day, 35- to 40-hour week. Photographers in business for themselves usually work longer hours. Depending upon the assignment, working hours for freelance photographers vary.

Freelance, press, and commercial photographers travel frequently and may work in uncomfortable surroundings. Sometimes the work can be dangerous, especially for photojournalists assigned to cover stories on natural disasters or military conflicts.

Many photographers work under pressure. Deadlines and demanding customers must be satisfied. Freelance photographers may find soliciting new clients frustrating and tedious.

## Employment

About 91,000 photographers were employed in 1980. The greatest proportion worked in photographic or commercial art studios; many others worked for newspapers, magazines, radio and television broadcasters, or motion picture companies. Government agencies, photographic equipment suppliers and dealers, and industrial firms also employed large numbers of photographers. Some were employed by colleges, universities, and other educational institutions. They prepared promotional and educational materials and also taught photography. Many worked freelance, taking pictures to sell to advertisers, magazines, and other customers; over 40 percent of all photographers were self-employed.

Jobs for photographers are found in all parts of the country—both small towns and large cities—but are concentrated in the more populated areas.

## Training, Other Qualifications, and Advancement

Although a high school education is desirable, photography has no set entry requirements for formal education or training. Employers usually seek applicants who have a broad technical understanding of photography as well as other photographic talents, such as imagination, creativity, and a good sense of timing. Technical expertise can be obtained through practical experience, postsecondary training, or some combination of the two. Some jobs do require that applicants have specialized knowledge in areas outside of photography.

Photographic training is available in colleges, universities, junior colleges, and art schools. About 75 colleges and universities offered 4-year curriculums leading to a bachelor's degree in photography in 1980. Some colleges and universities grant master's degrees in specialized areas, such as photojournalism. In addition, some colleges have 2-year curriculums leading to a certificate or an associate degree in photography. A formal education in photography gives a fundamental background in a variety of equipment, processes, and techniques. Art schools offer useful training in design and composition, but not the technical training needed for professional photographic work. The Armed Forces also train people in photographic skills.

People may prepare for work as photographers in a commercial studio through 2 or 3 years of on-the-job training as a photographer's assistant. Trainees generally start in the darkroom where they learn to mix chemicals, develop film, and do photoprinting and enlarging. Later they may set up lights and cameras or help an experienced photographer take pictures.

Amateur experience is helpful in getting an entry job with a commercial studio, but post-high school education and training usually are needed for industrial or scientific photography. Here success in photography depends on being more than just a competent photographer, and adequate career preparation requires some knowledge of the field in which the photography is used. For example, work in scientific, medical, and engineering research, such as photographing microscopic organisms, requires a background in the particular science or engineering specialty as well as skill in photography.

Photographers must have good eyesight and color vision, artistic ability, and manual dexterity. They should be patient, accurate, and enjoy working with detail. Some knowledge of mathematics, physics, and chemistry is helpful for understanding the use of various lenses, films, light sources, and development processes.

Some photographic specialties require additional qualities. Commercial or freelance photographers must be imaginative and original in their thinking. Those who specialize in photographing news stories must recognize a potentially good photograph and act quickly; otherwise, an opportunity to capture an important event on film may be lost. Writing ability sometimes is important for photojournalists, who may write captions and accompanying articles for their photographs. Photographers who specialize in portrait photography need the ability to help people relax in front of the camera.

Newly hired photographers are given relatively routine assignments that do not require split-second camera adjustments or decisions on what subject matter to photograph. News photographers, for example, may be assigned to cover civic meetings or photograph snow storms. After gaining experience, they advance to more demanding assignments, and some may move to staff positions on national news magazines. Photographers with exceptional ability may gain national recognition for their work and exhibit their photographs in art and photographic galleries, or publish them in books. A few industrial or scientific photographers may be promoted to supervi-

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sory positions. Magazine and news photographers may eventually become heads of graphic arts departments or photography editors.

## Job Outlook

Employment of photographers is expected to grow about as fast as the average for all occupations through the 1980's. In addition to openings resulting from increased demand for photographers, others will occur each year as workers transfer to other occupations, retire, or die.

Employment is expected to grow as business and industry place greater importance upon visual aids in meetings, stockholders' reports, sales campaigns, and public relations work. Photography is becoming an increasingly important part of law enforcement work, as well as scientific and medical research, where opportunities are expected to be good for those with appropriate technical skills. Employment in photojournalism is expected to grow slowly.

Employment of portrait and commercial photographers is also expected to grow slowly, and competition for jobs as portrait photographers and photographers' assistants is expected to be keen. These fields are relatively crowded since photographers can go into business for themselves with a modest financial investment, or work part time while holding another job. Increased use of self-processing cameras in commercial photography has contributed to crowding in this field, since little training is required for such work.

## Earnings

Beginning photographers who worked for newspapers that have contracts with The Newspaper Guild had weekly earnings between $175 and $649 in mid-1981, with the majority earning between $250 and $335. Newspaper photographers with some experience (usually 4 or 5 years) averaged about $440 a week in mid-1981. Almost all experienced newspaper photographers earned over $300; the top salary was $678 a week.

Photographers in the Federal Government earned an average of $18,200 a year in 1980.

Experienced photographers generally earn salaries that are above the average for nonsupervisory workers in private industry, except farming. Although self-employed and freelance photographers often earn more than salaried workers, their earnings are affected greatly by general business conditions and the type and size of their community and clientele.

## Related Occupations

Besides photographers, other workers who rely on their visual arts talents in their jobs include commercial artists, floral designers, illustrators, industrial designers, painters, and sculptors.

## Sources of Additional Information

Career information on photography is available from:

Professional Photographers of America, Inc., 1090 Executive Way, Des Plaines, Ill. 60018.

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# Performing Artists

The excitement of opening night, the thrill of an audience's applause, the joy of public recognition and admiration—these are some inducements for people to enter the performing arts. The opportunity for creative self-expression and the development of one's artistic talents are other reasons why some people become performing artists.

The performing arts include acting, dancing, instrumental music, and singing. These fields have the common goals of entertaining, communicating with, and affecting the emotions of audiences. All of a performer's work depends entirely upon his or her personal qualities—such as speech, appearance, facility in body movement, finger dexterity, and mental capacities.

Most aspiring artists spend many years in intensive training and practice before they are ready for professional performances. They not only need great natural talent but also determination, a willingness to work long and hard in their chosen field, and some luck.

Within the performing arts, the number of talented persons seeking employment generally exceeds by far the number of positions available. As a result, many performers are not able to find enough work in their field to be employed full time all year long. Many supplement their incomes by teaching, or work much of the time in occupations unrelated to the performing arts. Only the most successful performers can earn a living solely from their art; therefore, persons interested in these careers may wish to consider training for a backup or alternative field of work.

The statements that follow give detailed information on actors and actresses, dancers, musicians, and singers.

## Actors and Actresses

(D.O.T. 150.047-010)

### Nature of the Work

Actors and actresses entertain and communicate with people through their interpretation of dramatic roles. They rely on facial and verbal expression as well as body motions for their creative effort.

Making a character come to life before an audience is a job that has great glamour and fascination. However, acting requires persistence, practice, and hard work, as well as a special talent. Only a few actors and actresses achieve recognition as stars on the stage, in motion pictures, or on television. A somewhat larger number are well-known, experienced performers, who frequently are cast in supporting roles. However, most actors and actresses struggle for a toehold in the profession and pick up parts wherever they can. Employment for actors is characteristically unsteady. Many take temporary jobs, often as waiters or salesworkers, while waiting for their next acting parts to come along.

Beginning stage actors generally start in "bit" parts where they speak only a few lines. If successful, they may progress to larger, supporting roles. They frequently serve as understudies for the principals. Film and television actors, in contrast, may begin in large roles or move into programs from working in commercials.

In addition to the actors and actresses with speaking parts, "extras," who have no lines to deliver, are used in almost all motion pictures and many television shows and theater productions.

Some actors move into acting-related jobs as drama coaches or directors of stage, television, radio, or motion picture productions. A few teach drama in colleges and universities, where they usually specialize in a particular aspect of drama, such as stage movement, stage speech and voice, or acting. Some professional actors employed by theater companies also teach acting in courses offered to the public.

### Working Conditions

Acting demands patience and total commitment, since aspiring actors and actresses must wait for parts or filming schedules, work long hours, and travel often. Evening work is a regular part of a stage actor's life. Flawless performances require the tedious memorizing of lines and repetitive rehearsals—sometimes late at night after performances. Performances on television programs often allow little time for rehearsal, so that the actor must deliver a good performance with very little preparation. An actor needs stamina to withstand the heat of stage or studio lights, or the adverse weather conditions that may exist "on location." When plays are on the road, weekend traveling often is necessary.

### Employment

At any one time in 1980, an average of about 21,000 actors and actresses worked in motion pictures, stage plays, industrial shows, and commercials. Many others were between acting jobs, so that the total number of people actually employed as actors and actresses sometime during the year was higher. In the winter, most employment opportunities on the stage are in New York and other large cities. In the summer, stock companies in suburban and resort areas provide employment. In addition, many cities have "little theaters," repertory companies, and dinner theaters, which provide opportunities for local amateur talent as well as for professional actors and actresses. Normally, casts are selected in New York City for shows that go "on the road."

Employment in motion pictures and film for television is centered in Hollywood and New York City, although a few studios are located in Miami and other parts of the country. In addition, many films are shot on location and employ local professionals and nonprofessionals as "day players" and "extras." A number of American-produced films are shot in foreign countries. In television, most opportunities for actors are at the headquarters of the major networks—in New York, Los Angeles, and, to a lesser extent, Chicago. A few local television stations occasionally employ actors.

### Training and Other Qualifications

Aspiring actors should take part in high school and college plays, or work with little theaters and other acting groups for experience.

Some people do enter the field without formal training in acting. However, formal training or acting experience is generally necessary. Training in dramatic arts can be obtained at specialized schools in New York and Los Angeles, and at about 620 colleges and universities throughout the country offering bachelor's or higher degrees in dramatic and theater arts. College drama curriculums usually include courses in liberal arts, stage speech and movement, directing, playwriting, play production, and history of the drama, as well as practical courses in acting. From these, the student develops an appreciation of the great plays and the roles he or she may play.

In all media, the best way to start is to use local opportunities and to build on them. Many actors who are successful in local and regional productions eventually try to obtain work in New York or Los Angeles. Modeling experience may also be helpful in obtaining employment in television or motion pictures. Persons who plan to pursue an acting career need talent, creative ability, and training that will enable them to portray different characters. They must have poise, stage presence, and the ability to affect an audience. At the same time, the ability to follow directions is important. Physical appearance is often a deciding factor in being selected for particular roles. Actors should be prepared to face the anxiety of intermittent employment and rejections when auditioning for work.

Many actors rely on agents or managers to find them performing engagements, negotiate contracts, and plan their careers.

To become a movie extra, one must usually be listed by Central Casting, a no-fee


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agency that works with the Screen Extras Guild and supplies all extras to the major movie studios in Hollywood. Applicants are accepted only when the number of persons of a particular type on the list—for example, athletic young men, old ladies, or small children—is below the foreseeable need. In recent years, only a very small proportion of the total number of applicants have succeeded in being listed. An actor employed as an extra in a film has very little opportunity to advance to a speaking role in that film.

The length of a performer's working life depends largely on training, skill, versatility, and perseverance. Some actors and actresses work almost indefinitely. Many actors leave the occupation, however, because they can not find enough acting work to make a living.

## Outlook

The large number of people desiring acting careers, the lack of formal entry requirements, and the relatively small number of job openings have resulted in keen competition for acting jobs in the past. During the 1980's, many openings will occur as actors leave the occupation. In addition, some growth in employment is expected, in commercial theaters, with non-profit acting companies, and in television. However, there are not expected to be openings for all jobseekers, and the keen competition for acting jobs is expected to continue. Only the most talented are expected to be able to find regular employment.

## Earnings

Actors and actresses who appear on the stage belong to the Actors' Equity Association; in motion pictures, including television films, to the Screen Actors Guild, Inc., or to the Screen Extras Guild, Inc.; in television or radio, to the American Federation of Television and Radio Artists (AFTRA). These unions and the producers of the shows sign basic collective bargaining agreements which set minimum salaries, hours of work, and other conditions of employment. Each actor also signs a separate contract, which may provide for a higher salary than that specified in the basic agreement.

The minimum weekly salary for actors in Broadway productions was about $475 in 1980. Those in small "off-Broadway" theaters received minimums ranging from $153 to $317 a week, depending on the seating capacity of the theater. For shows on the road, the minimum rate was $45 extra per day. (All minimum salaries are adjusted upward automatically, by union contract, commensurate with increases in the cost of living as reflected in the Bureau of Labor Statistics' Consumer Price Index.)

In 1980, motion picture and television actors and actresses earned a minimum daily rate of $259, or $903 for a 5-day week. For extras, the minimum rate was $68 a day. Television actors also receive additional compensation for reruns.

Actors use body motion and facial expressions to create their characters.

However, earnings of most actors and actresses from acting work are low because their employment is irregular. According to data from Actors Equity Association, which represents about 26,000 actors in the legitimate theater, about 16,000 of their members had no earnings in 1979; and 6,000 members made less than $5,000; 3,600 members earned between $5,000 and $30,000, and only 400 members earned more than $30,000. The Screen Actors Guild, which has over 40,000 members reports that over 80 percent earned less than $5,000 from acting jobs in 1979; fewer than 5 percent earned $25,000 or more. Therefore, many actors must supplement their incomes from acting by maintaining other, nonacting jobs.

There are well-known actors and actresses who have salary rates above the minimums, and the salaries of the few top stars are many times the figures cited.

Eight performances amount to a week's work on the legitimate stage, and any additional performances are paid for as overtime. After the show opens, the basic workweek is 36 hours, including 12 hours for rehearsals. Before it opens, however, the workweek usually is longer to allow time for rehearsals.

Many actors who earn more than a set minimum per year are covered by a union health, welfare, and pension fund, including hospitalization insurance, to which employers contribute. Under some employment conditions, Equity and AFTRA members have paid vacations and sick leave. Most stage actors get little if any unemployment compensation solely from acting since they seldom have enough employment in any State to meet the eligibility requirements.

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## Related Occupations

Actors and actresses entertain people through their interpretations of dramatic roles. They rely on facial and verbal expressions as well as body motions for their creative expression. Related occupations for people with these skills include: Clowns, comedians, dancers, directors, disc jockeys, drama teachers or coaches, impersonators, mimes, narrators, and radio and television announcers. Other people working in theatrical occupations related to acting are playwrights, choreographers, script writers, stage managers, and set designers. Occupations involved with the business aspects of theater productions include producers, touring managers, booking managers, and actor's agents.

## Sources of Additional Information

Information on colleges and universities and conservatories that offer a major in drama is available from:

American Theater Association, 1000 Vermont Ave. NW., Washington, D.C. 20005.

Information about nonprofit regional theatres in the U.S. may be obtained from:

Theater Communications Group, Inc., 355 Lexington Ave., New York, N.Y., 10017.

Information about grants made in the performing arts is available from:

Information Office, National Endowment for the Arts, 2401 E St. NW., Washington, D.C. 20506.

League of Professional Theatre Training Programs, Suite 1515, 1860 Broadway, New York, N.Y. 10023.

# Dancers

(D.O.T. 151.047-010)

## Nature of the Work

Dancing is an ancient and worldwide art used to interpret an idea or a story, or simply to physically express rhythm and sound. Many professional dancers perform in classical ballet, which includes the stylized, traditional repertory, or modern dance, which allows more free movement and self-expression. Others perform in dance adaptations for musical shows, in folk, ethnic and jazz dances, and in other popular kinds of dancing. In addition to being an art form for its own sake, dance also is used to complement opera, musical comedy, and television performances.

In dance productions, performers most often work as a group, although a few top artists solo. Many dancers combine stage work with teaching. Some dancers create or choreograph original dances, teach them to performers, and sometimes direct and stage the presentations of their work.

## Working Conditions

Dancing is strenuous. Rehearsals require very long hours, and usually take place daily, including weekends and holidays. For shows on the road, weekend travel often is required. Most performances take place in the evening, and dancers must become accustomed to working late hours. Therefore, many dancers, by their thirties, transfer to related occupations such as choreographer or dance teacher or find work in other occupations. Certain celebrated dancers, however, continue performing beyond the age of 50.

## Places of Employment

An average of about 6,500 people worked as professional dancers at any one time in 1980. Many others were between engagements so that the total number of people employed as dancers at some time or other during the year was greater. In addition, in 1980, there were about 23,000 dance instructors in secondary schools, colleges and universities, dance schools, and private studios. Of these, many also worked from time to time as performers themselves.

New York City is the home for about one-half of the major dance companies. Other cities with full-time dance companies are Los Angeles, San Francisco, Seattle, Chicago, Dallas, Houston, Salt Lake City, Cincinnati, Cleveland, Boston, Philadelphia, and Atlanta.

## Training and Other Qualifications

Serious training for a career in dancing traditionally begins by about age 12. Early ballet training begins at age 7 or 8 and is usually given by private teachers and independent ballet schools. Students who demonstrate potential in the early teens receive more intensive and advanced professional training at regional ballet schools or schools conducted under the auspices of the major ballet companies. Leading dance school companies often have summer training programs from which they select candidates for admission to their regular full-time training program. Early and intensive training also is important for the modern dancer, but modern dance does not require as many years of training as ballet. Most dancers have their professional auditions by age 17 or 18, but training and practice never end. For example, professional ballet dancers take from 10 to 12 lessons a week for 11 or 12 months of the year, and must spend many additional hours practicing and rehearsing.

Because of the strenuous and time-consuming training required, a dancer's general education may be minimal. However, a broad general education including music, literature, history and the visual arts gives a background helpful in the interpretation of dramatic episodes, ideas, and feelings.

About 110 colleges and universities confer bachelor's or higher degrees in dance, generally through the departments of physical education, music, theater, or fine arts. Most programs concentrate on modern dance.

A college education is not essential to obtaining employment as a professional dancer. In fact, ballet dancers who postpone their first audition until graduation may compete at a disadvantage with younger dancers. On the other hand, a college degree can be helpful for the dancer who retires at an early age, as often happens, and wishes to enter another field of work.

Although a college education is an advantage for college or university teaching, it is not necessary for teaching dance or choreography in a studio. Studio schools usually require teachers to have experience as performers; colleges and conservatories generally require graduate degrees, but performance experience often may be substituted. Maturi-

Many professional dancers perform in classical ballet.

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ty and a broad educational background also are important.

The dancer's life is one of rigorous practice and self-discipline; therefore patience, perseverance, and a devotion to dance are essential. Good health and physical stamina are necessary, in order to practice and perform and to follow the rugged travel schedule often required.

Seldom does a dancer perform unaccompanied. Therefore, ability to function as part of a team is important. Dancers also should be prepared to face the anxiety of intermittent employment and rejections when auditioning for work.

Body height and build should not vary much from the average. Good feet and normal arches also are required. Above all, one must have agility, coordination, grace, a sense of rhythm, and a feeling for music, as well as a creative ability to express oneself through dance. Many dancers retire in their thirties or transfer to related fields such as teaching dance or becoming choreographers or dance directors.

## Employment Outlook

The large number of people seeking professional dancing careers and the relatively small number of job openings have resulted in keen competition for dancing jobs in the past. During the 1980's some job openings will occur as dancers leave the occupation. In addition, employment of dancers is expected to grow about as fast as the average for all occupations, with new professional dance companies, dance groups affiliated with colleges and universities, and in television. However, there are not expected to be openings for all jobseekers, and keen competition is expected to continue.

## Earnings

Dancers in opera ballet, classical ballet, and the modern dance belong to the American Guild of Musical Artists, Inc.; those on live or videotaped television belong to the American Federation of Television and Radio Artists; those who perform in films and TV belong to the Screen Actors Guild or the Screen Extras Guild; and those in musical comedies join Actors' Equity Association. The unions and producers sign basic agreements specifying minimum salary rates, hours of work, and other conditions of employment. However, the separate contract signed by each dancer with the producer of the show may be more favorable than the basic agreement regarding salary, hours of work, and working conditions. Many dancers who have professional engagements from time to time are not represented by any unions.

In 1980, the minimum salary for dancers in opera and other stage productions was about $330 a week. The single performance rate for ballet dancers was $125. Dancers on tour received an allowance of $45 a day in 1980 for room and board. Minimum performance rates for dancers on television ranged from $386 to $408 for a 1-hour show, depending on the number of dancers in the group. The performance rate covers 18 hours of rehearsal over a 3-day period, in addition to the performance. The normal workweek is 30 hours (6 hours per day maximum) spent in rehearsals and matinee and evening performances. Extra compensation is paid for additional hours worked.

However, earnings of most dancers from dancing are low because their employment is irregular. They often must supplement their incomes by taking temporary jobs unrelated to dancing.

Dancers covered by union contracts are entitled to some paid sick leave and various health and welfare benefits provided by their unions. Employers contribute toward these benefits. Most other dancers do not receive any fringe benefits.

## Related Occupations

Dancers express concepts and emotions through their body movements. They need grace, rhythm, and body control. Some related occupations which utilize actual training in dance or specialized knowledge of dance forms include acrobats, athletes, choreographers, dance critics, dance instructors, dance notators, dance therapists, and recreation workers.

## Sources of Additional Information

A list of colleges and universities that teach dance, including details on the types of courses offered, is available from:

National Dance Association, a Division of the American Alliance for Health, Physical Education, Recreation, and Dance, 1900 Association Dr., Reston, Va. 22091.

For information on all aspects of dance, including job listings, contact:

American Dance Guild, 1133 Broadway, Room 1427, New York, N.Y. 10010. Enclose a stamped, self-addressed envelope.

Information about the related field of dance therapy, along wih a list of schools that offer degrees in the field, is available from:

American Dance Therapy Association, Suite 230, 2000 Century Plaza, Columbia, Md. 21044.

# Musicians

(D.O.T. 152.041-010)

## Nature of the Work

The vast variety and wide appeal of music make it difficult to imagine a world without musicians. Professional musicians—those whose livelihoods depend upon performing for others—may play in a symphony orchestra, dance band, rock group, or jazz "combo." Whether their specialty is classical or popular music they all have behind them many years of formal or informal study and practice.

Popular music performers usually play the trumpet, trombone, clarinet, saxophone, organ, or one of the "rhythm" instruments—the piano, string bass, drums, or guitar. Most play engagements in nightclubs and restaurants, for musical comedies, in concerts, and at weddings and other special events. The best known artists sometimes perform on television.

Classical musicians play in symphony, opera, ballet, and theater orchestras, in churches and synagogues, and for other groups that require orchestral accompaniment. Some form small chamber music groups—usually a string quartet or a trio. These musicians play string, brass, woodwind, or percussion instruments. Many pianists accompany vocal or instrumental soloists, choral groups, or provide background music in restaurants or other places. Most organists play in churches; often they direct the choir.

A few well-known musicians give their own concerts, appear as soloists with symphony orchestras, and make recordings.

## Working Conditions

Musicians generally perform at night and on weekends, and also spend time in practice and rehearsal. Performances often require travel. Many musicians find only part-time work or experience unemployment between engagements. They often supplement their incomes with other types of jobs.

## Employment

An average of about 138,000 persons worked as performing musicians at any one time in 1980. Others were between engagements, so that the total number of people employed as musicians some time during the year was greater.

Many work in cities in which entertainment and recording activities are concentrated, such as New York City, Chicago, Los Angeles, Nashville, Miami Beach, and New Orleans. Many classical musicians perform with one of the 32 major symphony groups, the 30 regional orchestras, 115 metropolitan orchestras, or the hundreds of community orchestras. Many musicians also work in smaller cities and towns, playing in churches, clubs, and restaurants, and for weddings and other events. The Armed Forces, too, offer careers in their musical organizations.

## Training and Other Qualifications

Many people who become professional musicians begin studying an instrument at an early age. People need intensive training to acquire the necessary skill, knowledge of music, and ability to interpret music. This training may be obtained through private study with an accomplished musician, in a college or university music program, or in a music conservatory. For study in an institution, an audition frequently is necessary. Many teachers in these schools are accomplished artists who will train only promising young musicians.

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About 500 colleges, universities, and music conservatories offer bachelor's and/or higher degrees in music. About 600 conservatories and colleges and universities offer a bachelor's degree in music education to qualify graduates for a State certificate to teach in an elementary or secondary school.

Those who play popular music must have an understanding of and feeling for that style of music, but classical training may expand their employment opportunities. As a rule, they take lessons with private teachers when young, and seize every opportunity to make amateur or professional appearances. As they gain experience and become known, they perform with better known bands and orchestras.

Young persons who consider careers in music should have musical talent, versatility, creative ability, and poise and stage presence to face large audiences. Since quality performance requires constant study and practice, self-discipline is vital. Moreover, musicians who play concert and nightclub engagements must have physical stamina because of frequent traveling and night performances. They must also be prepared to face the anxiety of intermittent employment and rejections when auditioning for work.

Many musicians rely on agents or managers to find them performing engagements, negotiate contracts, and plan their careers.

## Employment Outlook

The large number of people desiring to be professional musicians, the lack of formal entry requirements for many types of jobs, and the relatively small number of job openings have resulted in keen competition for jobs in the past. During the 1980's, many openings will occur as musicians leave the occupation. In addition, employment is expected to grow about as fast as the average for all occupations. However, there are not expected to be openings for all jobseekers, and the keen competition for jobs as a musician is expected to continue. Only the most talented are expected to be able to find regular employment.

Because of the ease with which a musician can enter private music teaching, the number of music teachers has been more than sufficient to meet demand and probably will continue to be.

## Earnings

Earnings often depend on a performer's professional reputation as well as on geographic location.

Minimum salaries for musicians in major symphony orchestras in 1980 ranged from $252 to $600 a week, according to the American Symphony Orchestra League. Minimums in the regional symphony orchestras ranged from about $100 to $350 a week. Minimum wages for musicians in metropolitan symphony orchestras were generally between $20 and $40 per concert or rehearsal. Some musicians earned substantially more than the minimums, however.

The major symphony orchestras have seasons ranging from 28 to 52 weeks. Metropolitan and regional orchestras have shorter seasons.

Musicians in large metropolitan areas who had steady engagement contracts to play at dances, clubs, variety shows, ballets, musical comedies, and concerts, generally earned minimums ranging from $10 to $25 per hour in 1980. Wages for similar engagements in smaller cities and towns tended to be less. Musicians employed in motion picture recording earned a minimum of about $133 for a 3-hour session; those employed in television commercials earned a minimum of $61 each for 2 to 4 musicians and $56 each for more than 5 musicians for a 1-hour session. Musicians employed by recording companies were paid a minimum of about $147 for a 3-hour session in 1980.

Musicians employed by symphony orchestras work under master wage agreements, which guarantee a season's work up to 52 weeks. Many other musicians may face relatively long periods of unemployment between jobs. Thus, their earnings generally are lower than those in many other occupations. Moreover, since they may not work steadily for one employer, some performers cannot qualify for unemployment compensation, and few have either sick leave or vacations with pay. For these reasons, many musicians give private lessons or take jobs unrelated to music to supplement their earnings as performers.

Many musicians belong to a branch of the American Federation of Musicians, an AFL-CIO union. Concert soloists may also belong to the American Guild of Musical Artists, Inc. (AFL-CIO).

Many professional musicians teach.

## Related Occupations

Aside from actual performers, there are many music-related occupations. These include arrangers, composers, conductors, directors, orchestrators, librettists, and music therapists.

A technical knowledge of musical instruments is required by instrument repairers and tuners and copyists. In addition, there are a number of occupations in the business side of music such as booking agents, concert managers, music store owners and managers, salespersons of records, sheet music, and musical instruments, and music publishers. Others whose work involves music are disc jockeys, music critics, sound and audio technicians, music librarians, and radio and TV announcers.

## Sources of Additional Information

For answers to specific questions about wages, hours of work, and working conditions for professional musicians, contact:

American Federation of Musicians (AFL-CIO), 1500 Broadway, New York, N.Y. 10036.

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The requirements for certification of organists and choir masters are available from:

American Guild of Organists, 815 Second Ave., Suite 318, New York, N.Y. 10017.

For information about a career in music therapy, contact:

National Association for Music Therapy, Inc., P.O. Box 610, Lawrence, Kans. 66044.

For programs in music teacher education, contact:

Music Educators National Conference, 1902 Association Dr., Reston, Va. 22091.

Information about certification of private music teachers is available from:

Music Teachers National Association, 2113 Carew Tower, Cincinnati, Ohio 45202.

A list of accredited schools of music is also available for $5 from:

National Association of Schools of Music, 11250 Roger Bacon Dr., Reston, Va. 22090.

A brochure entitled *Careers in Music* produced jointly by the three organizations listed above, is available from any of the three.

Information about careers in orchestra management is available from:

American Symphony Orchestra League, P.O. Box 669, Vienna, Va. 22180.

# Singers

(D.O.T. 152.047-022)

## Nature of the Work

Singing is an age-old form of entertainment which, in one form or another, can be understood and appreciated by almost everyone. Singers interpret music using their knowledge of voice production, melody, and harmony. They sing character parts or perform in their own individual styles. Singers are classified according to their voice range—soprano, contralto, tenor, baritone, or bass, or by the type of music they sing, such as opera, rock, folk, or country and western.

A small number of singing stars make recordings or go on concert tours. Somewhat larger numbers of singers obtain leading or supporting roles in operas and popular music shows, secure engagements as concert soloists in oratorios and other types of performances, or become members of opera and musical comedy choruses and other professional choral groups. Popular music singers perform in movies, on the stage, on radio and television, in concerts, and in nightclubs and other places of entertainment.

## Working Conditions

Singers generally perform at night and on weekends, and must also practice and attend rehearsals. Except for a few well-known performers, few singers have steady jobs. Most experience some unemployment between engagements, or have to supplement their incomes with other kinds of jobs. Moreover, a singing career sometimes is relatively short, since it depends on a good voice, physical stamina, and public acceptance of the artist, all of which may be affected by age.

## Employment

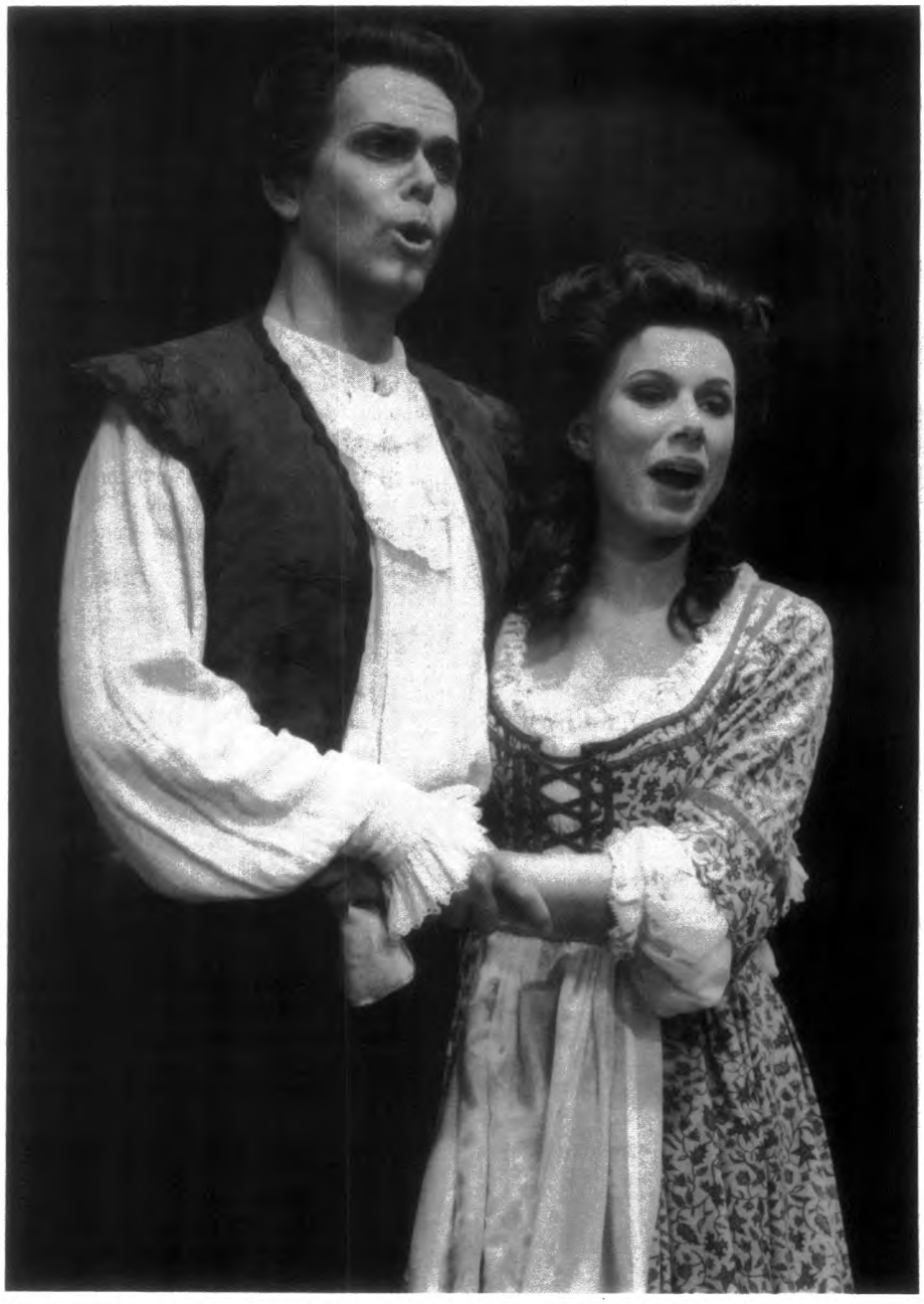
An average of about 19,000 persons worked as professional singers at any one time in 1980. Many others were between singing jobs, so that the total number of people employed as singers sometime during the year was greater. Opportunities for singing engagements are concentrated in New York City, Los Angeles, Las Vegas, San Francisco, Dallas, and Chicago—the Nation's chief entertainment centers. Nashville is a major center for performances and recordings by country and western singers. Many singers also work part time in church and synagogue choirs, or give private singing lessons.

Many other people with singing backgrounds are employed as music teachers in elementary and secondary schools, colleges, universities, and conservatories, and as choirmasters in church and synagogue choirs. (See the statements on teachers elsewhere in *Handbook*.)

## Training and Other Qualifications

A broad background in music, including its theory and history, is desirable, although it is not essential for all types of singing. The ability to dance also may be helpful for some roles. In addition, knowing how to play the piano may be an asset. As a rule, voice training should not begin until after the individual has matured physically. An audition often is required for advanced voice training. Voice training often continues for years after a singer's professional career has started.

Training for singers of classical music is available through private voice lessons and



Singers use their knowledge of melody and harmony in interpreting character parts.

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degree programs in music conservatories or departments of music in colleges and universities. These schools provide voice training, and also training in music interpretation, music-related foreign languages, and, sometimes, dramatics. Four-year programs grant a bachelor of music, bachelor of science or arts (in music), or bachelor of fine arts. Those who plan to teach singing in public schools need at least a bachelor's degree in music and must meet the State certification requirements for teachers. About 600 conservatories, colleges, and universities offer a degree program in music education. About 500 colleges, universities and conservatories offer bachelor's degrees in music.

Although voice training is an asset for singers of popular music, many with untrained voices have successful careers. The typical popular song does not require a voice with as wide a range as is required for classical music, and the lack of voice projection may be overcome with a microphone.

Singers of popular songs may become known by participating in local amateur shows or performances. These engagements may lead to employment with local dance bands or rock groups and possibly later with better known ones.

Besides musical ability, a singing career requires an attractive appearance, poise and stage presence, and perseverance. Singers also must have physical stamina to adapt to frequent traveling and rigorous time schedules, which often include night performances. They also must be prepared to face the anxiety of intermittent employment and rejections when auditioning for work. Many singers rely on agents to find them performing engagements, negotiate contracts, and plan their careers.

## Job Outlook

The large number of people desiring singing careers, the lack of formal entry requirements for many types of singers, and the relatively small number of job openings have resulted in keen competition for singing jobs in the past. During the 1980's, some openings will occur as singers leave the occupation. In addition, some growth in employment is expected, in opera, theater, nightclubs, and other areas. However, there are not expected to be openings for all jobseekers, and the keen competition for singing jobs is expected to continue. Only the most talented are expected to be able to find regular employment.

## Earnings

The union minimum rate for concert singers who were part of a chorus was $55 per performance in 1980. Members of an opera chorus earned a minimum daily rate of $50 per performance. A featured soloist received a minimum of $200 for each single performance. A few opera soloists and popular singers, however, earned thousands of dollars per performance. Minimum wage rates for group singers on network or syndicated television ranged between $160 and $200 per singer for a 1-hour show. Solo or duo singers received minimums of about $400 each for a one hour TV show. The minimum scale for phonograph recording artists is $100 per side. However, earnings of most singers from singing are low because their employment is irregular.

Professional singers usually belong to a branch of the Associated Actors and Artistes of America, an AFL-CIO union. Singers on the concert stage or in opera belong to the American Guild of Musical Artists, Inc.; those who sing on radio or television or make recordings are members of the American Federation of Television and Radio Artists; singers in the variety and nightclub field belong to the American Guild of Variety Artists; those in musical comedy and operettas belong to the Actors' Equity Association; and those on television or in motion pictures belong to the Screen Actors Guild, Inc.

## Related Occupations

Others who have careers concerned with vocal and instrumental music include composers, arrangers, orchestrators, and songwriters, as well as voice and music teachers, choir directors, and music therapists. There are many occupations in the business and technical side of music, such as artists' managers, business managers, booking managers, sound controllers, audio operators, sound recording technicians, and music librarians.

## Sources of Additional Information

A directory of accredited schools and departments of music is available for $3.25 from:

National Association of Schools of Music, 11250 Roger Bacon Dr., Reston, Va. 22090.

For information regarding programs in music teacher education, contact:

Music Educators National Conference, 1902 Association Dr., Reston, Va. 22091.

Information about certification of private music teachers is available from:

Music Teachers National Association, 2113 Carew Tower, Cincinnati, Ohio 45202.

A brochure entitled *Careers in Music* is available from any of the three organizations listed above.

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# Technologists and Technicians, Except Health

Technologists and technicians provide the technical assistance necessary for engineering, scientific, computer, and similar professional activities. These workers focus on the practical elements of a job, leaving the policy, theory, and design aspects to others.

Technologists and technicians perform the day-to-day tasks required in carrying out a project or running an operation. They may operate testing and measuring equipment in a laboratory; make drawings of new designs; build models of new projects; program computers; or safely guide airplanes to their destinations. They are employed wherever technical assistance in a specialized area is needed.

Most technologists and technicians work closely with and are supervised by professional workers. For example, engineering technicians work with engineers, science technicians with scientists, teacher aides with teachers, and legal assistants with lawyers. They are usually part of a team that is engaged in a particular project or operation.

In most specialties, technologists and technicians use complex electronic or mechanical instruments, technical manuals, or other specialized materials. For example, air traffic controllers guide pilots by reading sophisticated radar screens. Legal assistants conduct research using specialized law books. Programmers work with computers.

Because of the diversity of technologist and technician occupations, training requirements vary widely. All technologists and technicians must finish high school; however, most jobs require specialized postsecondary training. Training is offered at junior and community colleges, technical institutes, vocational schools, and extension divisions of colleges and universities. These programs usually emphasize practical courses and "hands-on" experience in a particular specialty. Programs vary in length. For example, most legal assistant programs require 2 years' work. On the other hand, many programmers complete 4-year bachelor's degree programs.

In addition to acquiring a formal education, technologists and technicians often receive on-the-job training from their employers. For example, programmers must spend at least several months working under close supervision. Upon completion of their training, they are capable of handling all aspects of their jobs. Occasionally, technologists and technicians take additional courses to keep abreast of technological advancements in their specialty.

While the knowledge and personal characteristics required in these jobs vary, most technologists and technicians need certain qualities. They often need a good foundation in mathematics and the basic sciences—physics, chemistry, and biology. They must apply practical knowledge to the solution of problems. Because they are often part of a team, technologists and technicians must follow directions well and effectively communicate their findings to others. They must be patient, precise, and organized in their work habits. Also, most technologists and technicians need manual dexterity to work with various kinds of equipment.

Nearly every industry employs some types of technologists or technicians. The accompanying table provides 1980 employment estimates for a range of occupations in this cluster.

**Table 1. Employment in selected technologist and technician occupations other than health, 1980**

| Occupation | Employment |
|---|---|
| Electrical and electronics technician | 359,000 |
| Drafter | 322,000 |
| Computer programmer | 228,000 |
| Mechanical engineering technician | 49,000 |
| Library technical assistant | 35,000 |
| Industrial engineering technician | 32,000 |
| Air traffic controller | 29,000 |
| Civil engineering technician | 25,000 |
| Broadcast technician | 17,000 |
| Tool programmer, numerical control | 12,000 |
| Embalmer | 11,000 |
| Title examiner and abstractor | 10,000 |

SOURCE: Bureau of Labor Statistics.

The following section of the *Handbook* presents detailed information on the nature of the work, employment, training requirements, job outlook, earnings, and working conditions for a representative sample of technologist and technician occupations.

## Air Traffic Controllers

(D.O.T. 193.162-018)

### Nature of the Work

Air traffic controllers are the guardians of the airways. They keep track of planes flying within their assigned area, and instruct pilots so as to keep the planes safe distances apart. Their immediate concern is safety, but controllers also must direct planes efficiently to minimize delays. Some regulate airport traffic; others regulate flights between airports.

Although airport tower controllers watch over all planes travelling through the airport's airspace, their main responsibility is to organize the flow of aircraft in and out of the airport. Relying both on radar and visual observation, they closely monitor each plane to maintain a safe distance between all aircraft and to guide pilots between the hanger or ramp and the end of the airport's airspace.

During arrival or departure, each plane is handled by several controllers. As a plane approaches an airport, the pilot radios ahead to inform the terminal of its presence. The "arrival controller" in the radar room just beneath the control tower has a copy of the plane's flight plan and already has observed the plane on radar. If the way is clear, the arrival controller directs the pilot to a runway; if the airport is busy, the plane is fitted into a traffic pattern with other aircraft waiting to land. As the plane nears the runway, the pilot is asked to contact the tower. There, a "local controller," who also is watching the plane on radar, monitors the aircraft the last mile or so to the runway, delaying any departures that would interfere with the plane's approach. Once the plane has landed, a "ground controller" in the tower directs it along the taxiways. The ground controller works almost entirely by sight, but may use radar if visibility is very poor.

A similar procedure is used for departures. The ground controller directs the plane to the proper runway. The local controller then informs the pilot about conditions at the airport, such as the weather, speed and direction of wind, and visibility. The local controller also instructs the pilot to take off, arranging a temporary break in arriving traffic if necessary. Once in the air, the plane is guided out of the airport's airspace by the "departure controller."

After each plane departs, airport tower controllers notify "enroute controllers" who will next take charge. There are 25 enroute control centers located around the country. Airplanes generally fly along designated routes; each center is assigned a certain airspace containing many routes. Enroute controllers work in teams of up to three members, depending on how heavy traffic is; each team is responsible for a section of the center's airspace. A team, for example, might be responsible for

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all planes that are between 30 to 100 miles north of an airport and flying at an altitude between 6,000 and 18,000 feet.

To prepare for planes about to enter the team's airspace, the "manual handoff controller" organizes flight plans coming over teletype machines. If two planes are scheduled to enter the team's airspace at a similar time, location, and altitude, this controller may arrange with the preceding control unit for one plane to change plans. The previous unit may have been another team at the same or an adjacent center, or a departure controller at a neighboring terminal. As a plane approaches a team's airspace, the "radar handoff controller" accepts responsibility for the plane from the previous controlling unit. The controller also delegates responsibility for the plane to the next controlling unit when the plane leaves the team's airspace.

The "radar controller," who supervises the other team members, observes the planes in the team's airspace on radar and communicates with the pilots when necessary. Radar controllers warn pilots about nearby planes, bad weather conditions, and other possible hazards. Two planes on a collision course will be directed around each other. If a pilot wants to change altitude in search of better flying conditions, the controller will check to determine that no other planes will be along the proposed path. As the flight progresses, the team responsible for the aircraft notifies the next team in charge. Through team coordination, the plane arrives safely at its destination.

Both airport tower and enroute controllers usually control several planes at one time and often have to make quick decisions about completely different activities. For example, a controller might direct a plane on its landing approach and at the same time provide pilots entering the airport's airspace with information about conditions at the airport. While instructing these pilots, the controller also would observe other planes in the vicinity, such as those in a holding pattern waiting for permission to land, to ensure that they remain well separated.

In addition to airport towers and enroute centers, air traffic controllers also work in flight service stations operated at over 300 airports. These controllers provide pilots with information on the station's particular area, including terrain, preflight and inflight weather information, suggested routes, and other information important to the safety of a flight.

## Working Conditions

Controllers work a basic 40-hour week; however, they may work additional hours for which they receive overtime pay or equal time off. Because control towers and centers operate 24 hours a day, 7 days a week, controllers rotate night and weekend shifts.

During busy times controllers must work rapidly and under great stress. Mental pressure is particularly acute when traffic stacks up under poor flying conditions. They must keep track of several planes at the same time and make certain all pilots receive correct instructions.

## Employment

About 29,000 persons worked as air traffic controllers for the Federal Aviation Administration (FAA) in 1980, at airports in towers and flight service stations and in enroute traffic control centers.

## Training, Other Qualifications, and Advancement

Air traffic controller trainees are selected through the competitive Federal Civil Service System. Applicants must pass a written test that measures their ability to learn the controller's duties. In addition, applicants must have 3 years of general work experience or 4 years of college, or a combination of both. Applicants must pass physical and psychological examinations and have vision correctable to 20/20. For airport tower and enroute center positions, applicants must be less than 31 years old. Those 31 years old and over are eligible for positions at flight service stations.

Potential controllers should be articulate, since directions to pilots must be given quickly and clearly. A good memory also is important because controllers constantly receive information which they must immediately grasp, interpret, and remember. Decisiveness is an asset, since controllers often have to make quick decisions.

Successful applicants receive a combination of on-the-job and formal training to learn the fundamentals of the airway system, Federal aviation regulations, controller equipment, and aircraft performance characteristics. They receive approximately 16 weeks of intensive training, including practice on simulators, at the FAA Academy in Oklahoma City. It then takes several years of progressively more responsible work experience, interspersed with considerable classroom instruction and independent study, to become a fully qualified controller.

At airports, new controllers begin in the tower, where they clear planes for takeoff. The next step is to ground controller followed by local controller, then departure controller, and finally, arrival controller. At an enroute traffic control center, new controllers first deliver teletyped flight plans to teams, gradually advancing to manual handoff controller, then radar handoff controller and then radar controller. Failure to become proficient in any position at a facility within a specified time may result in dismissal. Controllers who fail to complete either the academy or the on-the-job portion of the training are dismissed. Each year controllers must pass a physical examination. They must pass a job performance examination twice each year and a physical examination once a year.

Controllers can transfer to jobs at different locations, or advance to supervisory positions, including management or staff jobs in air traffic control and top administrative jobs in the FAA.

Controllers often direct several planes at the same time.

## Job Outlook

Employment of air traffic controllers is expected to increase about as fast as the average for all occupations through the 1980's. In addition to openings resulting from growth in the demand for controllers, others will arise as experienced controllers retire, die, or leave the occupation for other reasons. Competition for jobs should be keen, however, because the number of qualified

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applicants is expected to be much greater than the number of openings.

As the number of aircraft increases, the skyways will become more congested and more controllers will be needed. Also, to prevent collisions, the FAA has created spaces near certain airports and above certain altitudes within which pilots must receive directions from air traffic controllers. If, as expected, the number and size of these spaces are expanded, additional controllers will be needed despite the greater use of new, automated control equipment.

College graduates or individuals who have civilian or military experience as controllers, pilots, or navigators will have the best employment opportunities.

The demand for air travel and the workloads of air traffic controllers decline during recessions, but controllers seldom are laid off. Until the demand for air travel resumes, few new controllers are hired.

## Earnings

Air traffic controllers who started with the FAA in early 1981 earned about $12,300 or $15,200 a year, depending on their education, experience, and score on the FAA written examination. In 1980, controllers averaged $29,900 a year. Depending on length of service, they receive 13 to 26 days of paid vacation and 13 days of paid sick leave each year, life insurance, health benefits, and, due to the stress involved in the work, a more liberal retirement program than other Federal employees.

## Related Occupations

Other occupations which involve the direction and control of traffic in air transportation are airline-radio operator, airplane dispatcher, and flight service specialist.

## Sources of Additional Information

For further information, request *Government Careers*, publication GA-300-128, (enclose a self-addressed mailing label) from:

U.S. Government Printing Office, Library and Statutory Distribution Service, 5208 Eisenhower Ave., Alexandria, Va. 22304.

A pamphlet providing general information about controllers and instructions for submitting an application is available from any U.S. Office of Personnel Management Job Information Center. Look under U.S. Government, Office of Personnel Management, in your telephone book to obtain a local Job Information Center telephone number and call for a copy of Announcement 418. If there is no listing in your telephone book, dial the toll-free number 800-555-1212 and request the number of the Office of Personnel Management Job Information Center for your location.

# Broadcast Technicians

(D.O.T. 003.167-030 and -034; 193.167-014, .262-018 and -038; 194.262-010 and -018, .282, .362, and .382-014; 822.281-030; 962.162, .167-010, .281-014 and -018, .362-014, .384, and .665)

## Nature of the Work

Broadcast technicians operate and maintain the electronic equipment used to record and transmit radio and television programs. They work with microphones, sound and video tape recorders, light and sound effects, television cameras, transmitters, and other equipment.

In the control room of the radio or television broadcasting studio, these technicians operate equipment that regulates the signal strength, clarity, and range of sounds and colors in the material being recorded or broadcast. They also operate control panels that select the source of the material being broadcast. Technicians may switch from one camera or studio to another, from film to live programming, or from network to local programs. By means of hand signals and, in television, by use of telephone headsets, they give technical directions to personnel in the studio.

When events outside the studio are to be broadcast, technicians go to the site and set up, test, and operate the equipment. After the broadcast, they dismantle the equipment and return it to the station.

As a rule, broadcast technicians in small stations perform a variety of duties. In large stations and in networks, on the other hand, technicians are more specialized, although specific job assignments may change from day to day. *Transmitter operators* monitor and log outgoing signals and are responsible for operating the transmitter. *Maintenance technicians* set up, adjust, service, and repair electronic broadcasting equipment. *Audio control engineers* regulate sound pickup, transmission, and switching, and *video control engineers* regulate the quality, brightness, and contrast of television pictures. The lighting equipment used during the production of television programs is controlled by *lighting technicians*. When programs originate outside the studio, *field technicians* set up and operate broadcasting equipment. *Recording technicians* operate and maintain sound recording equipment; *video recording technicians* operate and maintain video tape recording equipment. Some technicians operate equipment designed to produce special effects, such as the illusions of a bolt of lightning or the sound of a police siren. The terms "operator," "engineer," and "technician" often are used interchangeably in describing these jobs.

Supervisory personnel with job titles such as *chief engineer* or *transmission engineer* direct activities concerned with the operation and maintenance of studio broadcasting equipment.

## Working Conditions

Broadcast technicians generally work indoors in pleasant surroundings. Many stations are air-conditioned because transmitters and other electronic equipment must be operated at cool temperatures. Broadcasts outside the studio, however, may require technicians to work out of doors under less favorable conditions.

Network technicians may ocasionally have to work long hours under great pressure to meet broadcast deadlines.

Broadcast technicians need a strong technical background, including courses in electronics.

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## Employment

About 17,000 broadcast technicians were employed in radio and television stations in 1980. Television stations employ, on the average, many more technicians than radio stations. Although broadcast technicians are employed in every State, most are located in large metropolitan areas. The highest paying and most specialized jobs are concentrated in New York City, Los Angeles, and Washington, D.C.—the originating centers for most of the network programs.

## Training, Other Qualifications, and Advancement

Federal law requires that anyone who operates broadcast transmitters in radio and television stations must have a restricted radiotelephone operator permit, for which no examination is required. Persons who work with microwave or other internal radio communications equipment however, must have a general radiotelephone operator license, issued after the applicant passes a series of written examinations. These cover communications law and regulations, radio operating practices, and basic communications electronics.

High school courses in algebra, trigonometry, physics, electronics, and other sciences provide valuable background for a career in this occupation. Building electronic hobby kits and operating a ''ham'' or amateur radio also are good introductions to broadcasting technology. Taking an electronics course in a technical school is still another good way to acquire the knowledge for becoming a broadcast technician. Some persons gain work experience as temporary employees while filling in for regular broadcast technicians who are on vacation.

Many schools give courses especially designed to prepare the student for the FCC's license test. Technical school, community college, or college training is an advantage, particularly for those who hope to advance to supervisory positions or to the more specialized jobs in large stations and in the networks.

Broadcast technicians must have an aptitude for working with electrical and mechanical systems and equipment. Manual dexterity, the ability to perform tasks requiring precise, coordinated hand movements, is necessary for success in this occupation.

Entry level workers are instructed and supervised by the chief engineer, or by other experienced technicians, concerning the work procedures of the station. They generally begin their careers in small stations, operating the transmitter and handling other technical duties, after a brief instruction period. As they acquire more experience and skill, they are assigned to more responsible jobs. Those who demonstrate above-average ability may move into top level technical positions such as supervisory technician or chief engineer. A college degree in engineering is becoming increasingly important for advancement to supervisory and executive positions.

## Job Outlook

People seeking beginning jobs as broadcast technicians face strong competition, especially in major metropolitan areas where the number of qualified jobseekers greatly exceeds the number of openings. Prospects for entry level positions are best in smaller cities for people with appropriate training in electronics. As is the case with other occupations in radio and television broadcasting, stations in major metropolitan areas seek highly experienced personnel to fill broadcast technician jobs.

Employment of broadcast technicians is expected to increase about as fast as the average for all occupations through the 1980's. New job opportunities for technicians will arise as new commercial radio and television stations go on the air, established stations increase their broadcasting hours, and cable television stations broadcast more of their own programs. However, demand for broadcast technicians may not keep pace with the increase in broadcasting because of laborsaving technical advances such as computer controlled programming and remote control of transmitters. Technological developments such as these have shifted the emphasis from operations to maintenance work, which frequently is performed by service personnel employed by broadcasting equipment manufacturers. Most job openings will result from the need to replace experienced technicians who retire, die, or transfer to other occupations.

## Earnings

In 1980, average earnings for technicians at radio stations were $262 a week. In television, earnings were somewhat higher, about $295 a week. As a rule, technician wages are highest in large cities and large stations. Technicians in the largest stations earned, on the average, about two-thirds more than those in the smallest stations. Earnings of experienced technicians were much higher and licensed technicians who can perform the full range of tasks are, of course, the highest paid. Television stations usually pay higher salaries than radio stations because television work is generally more complex. Technicians employed by educational broadcasting stations generally earn less than those who work for commercial stations.

Most technicians in large stations work a 40-hour week with overtime pay for additional hours. Broadcast technicians in small stations generally work a considerable amount of overtime. Evening, night, and weekend work frequently is necessary since many stations are on the air 24 hours a day, 7 days a week.

## Related Occupations

Broadcast technicians need the electronics training and hand coordination necessary to operate technical equipment; they generally complete specialized postsecondary programs, including courses in electronics and engineering. Others whose jobs have similar requirements include drafters, engineering and science technicians, surveyors, air traffic controllers, radiologic technologists, respiratory therapy workers, electrocardiograph technicians, electroencephalographic technicians, and medical laboratory technicians.

## Sources of Additional Information

For information about radiotelephone operator permits and licenses, write to:

Federal Communications Commission, 1919 M St. NW., Washington, D.C. 20554.

For information on careers for broadcast technicians, write to:

National Association of Broadcasters, 1771 N St. NW., Washington, D.C. 20036.

For a list of schools that offer programs or courses in broadcasting, contact:

Broadcast Education Association, National Association of Broadcasters, 1771 N St. NW., Washington, D.C. 20036.

# Drafters

(D.O.T. 001.261-010 and -014; 002.261-010; 003.281-010 and -014; 005.281-010 and -014; 007.161-018, .167-022, .261-010, -014, -018, -022, and .281-010; 010.281-010, -014, -018; 014.281-010 and -017)

## Nature of the Work

When building a satellite, television set, or bridge, workers follow drawings that show the exact dimensions and specifications of the entire object and each of its parts. Workers who draw these plans are drafters.

Drafters prepare detailed drawings based on rough sketches, specifications, and calculations made by scientists, engineers, architects, and designers. They also calculate the strength, quality, quantity, and cost of materials. Final drawings contain a detailed view of the object from all sides as well as specifications for materials to be used, procedures followed, and other information to carry out the job.

In preparing drawings, drafters use compasses, dividers, protractors, triangles, and other drafting devices. They also use technical handbooks, tables, and calculators to help solve problems. Drafters increasingly use computer-aided systems and electronic drafting equipment to prepare drawings.

Drafters are classified according to the work they do or their level of responsibility. *Senior drafters* translate an engineer's or architect's preliminary plans into design ''layouts'' (scale drawings of the object to be built). *Detailers* draw each part shown on the layout, and give dimensions, materials, and other information to make the drawing clear and complete. *Checkers* carefully examine drawings for errors in computing or recording dimensions and specifications. Under the supervision of experienced drafters, *tracers* make minor corrections and trace drawings for reproduction on paper or plastic film.

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Drafters usually specialize in a particular field of work, such as mechanical, electrical, aeronautical, structural, or architectural drafting.

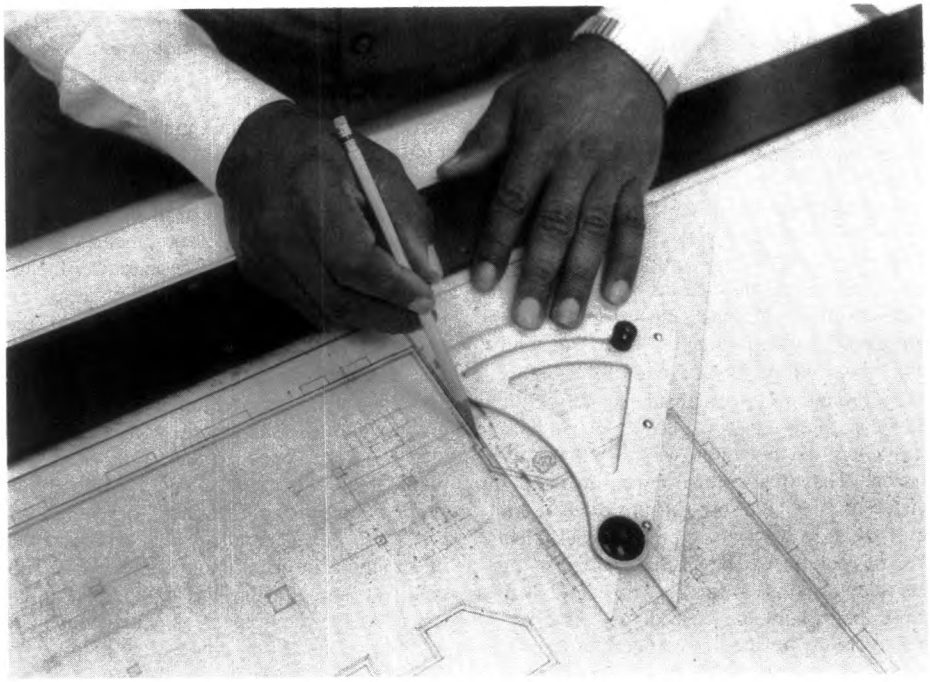
## Working Conditions

Although drafters usually work in well-lighted and well-ventilated rooms, they often must sit and do very detailed work for long periods of time. This work may cause eye strain and back discomfort.

## Employment

About 322,000 persons worked as drafters in 1980. Engineering and architectural firms are the largest employers of drafters. Many drafters also work in durable goods manufacturing industries, such as fabricated metals and electrical equipment and machinery, and in construction.

About 20,000 drafters worked in government in 1980, primarily at the State and local level. Most drafters in the Federal Government worked for the Department of Defense. Some drafters worked for colleges and universities and nonprofit organizations.



Drafters need to pay careful attention to detail.

## Training, Other Qualifications, and Advancement

Employers prefer applicants for drafting positions who have acquired training in technical institutes, junior and community colleges, extension divisions of universities, and vocational and technical high schools. Some persons receive training and experience in the Armed Forces. Others qualify through on-the-job training programs combined with part-time schooling or through 3- to 4-year apprenticeship programs.

Training for a career in drafting, whether in a high school or post-high school program, should include courses in mathematics, physical sciences, mechanical drawing, and drafting. Shop practices and shop skills also are helpful since most higher level drafting jobs require knowledge of manufacturing or construction methods. Many technical schools offer courses in structural design, architectural drawing, and engineering or industrial technology.

Those planning careers in drafting should be able to do freehand drawings of three-dimensional objects and also detailed work requiring a high degree of accuracy. They should have good eyesight and manual dexterity. In addition, they should be able to function as part of a team since they work directly with engineers, architects, designers, and other workers. Artistic ability is helpful in some specialized fields.

High school graduates usually start out as tracers. Those having post-high school technical training may begin as junior drafters. After gaining experience, they may advance to checkers, detailers, senior drafters, or supervisors. Some may become independent designers.

## Job Outlook

Employment of drafters is expected to increase faster than the average for all occupations through the 1980's because of industrial growth and the increasingly complex design problems of products and processes. Openings also will result from the need to replace drafters who move into other fields of work, retire, or die.

Holders of an associate degree in drafting and persons who are trained in the use of computer-aided drafting systems and electronic drafting equipment will have the best prospects for employment. Many large employers already require post-secondary technical education, though well-qualified high school graduates who have studied drafting may find opportunities in some types of jobs. Photoreproduction of drawings and the expanding use of electronic drafting equipment and computers, however, will reduce the need for less skilled drafters.

Drafters are highly concentrated in industries that are sensitive to cyclical swings in the economy such as engineering and architectural services and durable goods manufacturing. During an economic recession, drafters may be laid off as fewer products are designed, less research and development work is done, and fewer drafting services are needed.

## Earnings

In private industry, beginning drafters averaged about $10,200 a year in 1980, while more experienced drafters averaged between $11,700 and $17,200 a year. Senior drafters averaged about $21,700 a year in 1980.

The Federal Government paid drafters who have an associate degree starting salaries of about $11,000 a year in early 1981. Those with less education or experience generally started at $9,800. The average Federal Government salary for all drafters was about $14,000 a year in 1980.

## Related Occupations

Other occupations in which workers are required to prepare or understand detailed drawings, make accurate and precise calculations and measurements, and use various measuring devices include architects, engineering technicians, engineers, landscape architects, photogrammetrists, and surveyors.

## Sources of Additional Information

General information on careers for drafters is available from:

American Institute for Design and Drafting, 3119 Price Rd., Bartlesville, Okla. 74003.

See Sources of Additional Information in the following statement on engineering and science technicians.

# Engineering and Science Technicians

## Nature of the Work

Knowledge of science, mathematics, industrial machinery, and technical processes enables engineering and science technicians to work in all phases of business and government—from research and design to manufacturing, sales, and customer service. Although their jobs are more limited in scope and more practically oriented than those of engineers or scientists, technicians often apply the theoretical knowledge developed by engineers and scientists to actual situations. Technicians frequently use more complex electronic and mechanical instruments, experimental

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laboratory equipment, and drafting instruments. Almost all technicians described in this statement must be able to use technical handbooks and calculators, and some must work with computers.

In research and development, one of the largest areas of employment of engineering and science technicians, these workers set up experiments and calculate the results, sometimes with the aid of computers. They also assist engineers and scientists in developing experimental equipment and models by making drawings and sketches and, frequently, by doing routine design work.

In production, technicians usually follow the plans and general directions of engineers and scientists, but often without close supervision. They may prepare specifications for materials, devise tests to insure product quality, or study ways to improve the efficiency of an operation. They often supervise production workers to make sure they follow prescribed plans and procedures. As a product is built, technicians check to see that specifications are followed, keep engineers and scientists informed on progress, and investigate production problems.

As sales workers or field representatives for manufacturers, technicians give advice on installation and maintenance of complex machinery, and may write specifications and technical manuals. (See statement on technical writers elsewhere in the *Handbook*.)

Technicians may work in engineering, physical science, or life science. Within these general fields, job titles may describe the level (biological aide or biological technician), duties (quality control technician or time study analyst), or area of work (mechanical, electrical, or chemical).

An engineering technician might work in one of the following areas:

*Aeronautical Technology*. In this area, the technician works with engineers and scientists to design and produce aircraft, rockets, guided missiles, and spacecraft. Many aid engineers in preparing design layouts and models of structures, control systems, or equipment installations by collecting information, making computations, and performing laboratory tests. For example, a technician might estimate weight factors, centers of gravity, and other items affecting load capacity of an airplane or missile. Other technicians prepare or check drawings for technical accuracy, practicability, and economy.

Aeronautical technicians frequently work as manufacturers' field service representatives, serving as the link between their company and the military services, commercial airlines, and other customers. Technicians also prepare technical information for instruction manuals, bulletins, catalogs, and other literature. (See statements on aerospace engineers, aircraft mechanics, and technical writers elsewhere in the *Handbook*.)

*Air-Conditioning, Heating, and Refrigeration Technology*. Air-conditioning, heating, and refrigeration technicians design, manufacture, sell, and service equipment to regulate indoor temperatures. Technicians in this field often specialize in one area, such as refrigeration, and sometimes in a particular type of activity, such as research and development.

When working for firms that manufacture temperature-controlling equipment, technicians generally work in research and engineering departments, where they assist engineers and scientists in the design and testing of new equipment or production methods. For example, a technician may construct an experimental model to test its durability and operating characteristics. Technicians also work as sales workers for equipment manufacturers or dealers, and must be able to supply engineering firms and other contractors that design and install systems with information on installation, maintenance, operating costs, and the performance specifications of the equipment. Other technicians work for contractors, where they help design and prepare installation instructions for air-conditioning, heating, or refrigeration systems. Still others, in customer service, are responsible for supervising the installation and maintenance of equipment. (See statement on air-conditioning, refrigeration, and heating mechanics elsewhere in the *Handbook*.)

*Civil Engineering Technology*. Technicians in this area assist civil engineers in planning, designing, and constructing highways, bridges, dams, and other structures. They often specialize in one area, such as highway or structural technology. During the planning stage, they estimate cost, prepare specifications for materials, or participate in surveying, drafting, or designing. Once construction begins, they assist the contractor or superintendent in scheduling construction activities or inspecting the work to assure conformance to blueprints and specifications. (See statements on civil engineers, drafters, and surveyors and surveying technicians elsewhere in the *Handbook*.)

*Electronics Technology*. Technicians in this field develop, manufacture, and service electronic equipment and systems. The types of equipment range from radio, radar, sonar, and television to industrial and medical measuring or control devices, navigational equipment, and computers. Because the field is so broad, technicans often specialize in one area, such as automatic control devices or electronic amplifiers. Furthermore, technological advances are constantly opening up new areas of work such as integrated circuit technology.

When working in design, production, or customer service, electronic technicians use sophisticated measuring and diagnostic devices to test, adjust, and repair equipment. In many cases, they must understand the field in which the electronic device is being used. To design equipment for space exploration, for example, a technician must consider the need for minimum weight and volume and maximum resistance to shock, extreme temperature, and pressure. Some electronics technicians also work in technical sales, while others work in the radio and television broadcasting industry. (See statement on broadcast technicians elsewhere in the *Handbook*.)

*Industrial Engineering Technology*. Technicians in this area, usually called industrial production technicians, assist industrial engineers on problems involving the efficient use of personnel, materials, and machines to produce goods and services. They prepare layouts of machinery and equipment, plan the flow of work, make statistical studies, and analyze production costs. Industrial engineering technicians also conduct time and motion studies (analyze the time and movements a worker needs to accomplish a task) to improve the production methods and procedures in manufacturing plants.

Many industrial engineering technicians acquire experience that enables them to qualify for other jobs. For example, those specializing in machinery and production methods may move into industrial safety. Others, in job analysis, may set job standards and interview, test, hire, and train personnel. Still others may move into production supervision. (See statements on personnel and labor relations workers and industrial engineers elsewhere in the *Handbook*.)

*Mechanical Engineering Technology*. Mechanical engineering technology is a broad term that covers a large number of specialized fields including automotive, diesel, and production technology and tool and machine design.

Mechanical engineering technicians assist engineers in design and development work by making freehand sketches and rough layouts of proposed machinery and other equipment and parts. This work requires knowledge of mechanical principles involving tolerance, stress, strain, friction, and vibration factors. Technicians also analyze the costs and practical value of designs.

In planning and testing experimental machines and equipment for performance, durability, and efficiency, technicians record data, make computations, plot graphs, analyze results, and write reports. They sometimes recommend design changes to improve performance. Their job often requires skill in the use of complex instruments, test equipment, and gauges, as well as in the preparation and interpretation of drawings.

When a product is ready for production, technicians help prepare layouts and drawings of the assembly process and of parts to be manufactured. They frequently help estimate labor costs, equipment life, and plant space. Some mechanical engineering technicians test and inspect machines and equipment in manufacturing departments or work

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with engineers to eliminate production problems. Others are technical sales workers.

Tool designers are among the better known specialists in mechanical engineering technology. Tool designers prepare sketches of designs for cutting tools, jigs, dies, special fixtures, and other devices used in mass production. Frequently, they redesign existing tools to improve their efficiency. They also make or supervise others who make detailed drawings of tools and fixtures. (See statements on mechanical engineers and drafters elsewhere in the *Handbook*.)

*Instrumentation Technology*. Automated manufacturing and industrial processes, oceanographic and space exploration, weather forecasting, satellite communication systems, environmental protection, and medical research have helped to make instrumentation technology a fast-growing field. Technicians help develop and design complex measuring and control devices such as those in a spacecraft that sense and measure changes in heat or pressure, automatically record data, and make necessary adjustments. These technicians have extensive knowledge of physical sciences as well as electrical-electronic and mechanical engineering.

Several areas of employment opportunity for technicians exist in the physical sciences: *Chemical technicians* work with chemists and chemical engineers to develop, sell, and utilize chemical and related products and equipment. Most chemical technicians do research and development, testing, or other laboratory work. They often set up and conduct tests on processes and products being developed or improved. For example, a technician may examine steel for carbon, phosphorus, and sulfur content or test a lubricating oil by subjecting it to changing temperatures. The technician measures reactions, analyzes the results of experiments, and records data that will be the basis for decisions and future research.

Chemical technicians in production generally put into commercial operation those products or processes developed in research laboratories. They assist in making the final design, installing equipment, and training and supervising operators on the production line. Technicians in quality control test materials, production processes, and final products to insure that they meet the manufacturer's specifications and quality standards. Many also sell chemicals or chemical products as technical sales personnel.

Many chemical technicians use computers and instruments, such as a dilatometer (which measures the expansion of a substance). Because the field of chemistry is so broad, chemical technicians frequently specialize in a particular industry, such as food processing or pharmaceuticals. (See statements on chemists and chemical engineers elsewhere in the *Handbook*.)

*Mathematical technicians* work with scientific and engineering personnel to solve technological problems encountered in research and development and other areas. They apply standardized mathematical formulas to raw data to help translate these data into usable equations, graphs, and other forms. Mathematical technicians often use computers, card punch machines, calculators, and data processing equipment. (See statement on mathematicians elsewhere in the *Handbook*.)

*Meteorological technicians* support meteorologists in the study of atmospheric conditions. Technicians calibrate instruments, observe, record, and report meteorological occurrences, and assist in research projects and the development of scientific instruments.

*Geological technicians* assist geologists in evaluating earth processes. Currently much research is being conducted in seismology, petroleum and mineral exploration, and ecology. These technicians install and record measurements from seismographic instruments, assist in field evaluations of earthquake damage and surface displacement, or assist geologists in earthquake prediction research. In petroleum and mineral exploration, they help conduct tests and record sound wave data to determine the likelihood of successful drilling, or use radiation detection instruments and collect core samples to help geologists evaluate the economic possibilities of mining a given resource.

*Hydrologic technicians* gather data to help hydrologists predict river stages and water quality levels. They monitor instruments that measure water flow, water table levels, or water quality, and record and analyze the data obtained. (See statement on oceanographers elsewhere in the *Handbook*.)

Technicians often build laboratory equipment.

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Technicians in the life sciences generally are classified in either of two broad categories:

*Agricultural technicians* work with agricultural scientists in food production and processing. Plant technicians conduct tests and experiments to improve the yield and quality of crops, or to increase resistance of plants to disease, insects, or other hazards. Technicians in soil science analyze the chemical and physical properties of various soils to help determine the best uses for these soils. Animal husbandry technicians work mainly with the breeding and nutrition of animals. Other agricultural technicians are employed in the food industry as food processing technicians. In quality control or in food science research, they help scientists develop better and more efficient ways of processing food material for human consumption. (See statement on food technologists elsewhere in the *Handbook*.)

*Biological technicians* work primarily in laboratories where they perform tests and experiments under controlled conditions. Microbiological technicians study microscopic organisms and may be involved in immunology or parasitology research. Laboratory animal technicians study and report on the reaction of laboratory animals to certain physical and chemical stimuli. They also study and conduct research to help biologists develop cures for human diseases. By conducting experiments and reporting the results to a biochemist, technicians assist in analyzing biological substances (blood, other body fluids, foods, and drugs). A biological technician also might work with insects to study insect control, develop new insecticides, or determine how to use insects to control other insects or undesirable plants. (See statements on life scientists elsewhere in the *Handbook*.)

Technicians also specialize in fields such as metallurgical (metal), electrical, and optical technology. In the nuclear energy field, technicians work with scientists and engineers on problems of radiation safety, inspection, and decontamination. Other areas of work include environmental protection, where technicians study the problems of air and water pollution, and industrial safety.

## Working Conditions

Technicians work under a wide variety of conditions. Most work regular hours in laboratories and industrial plants. Others work part or all of their time outdoors. Some occasionally are exposed to safety or health hazards from equipment or materials.

## Employment

About 885,000 persons worked as engineering and science technicians in 1980. About four-fifths of all technicians worked in private industry. In the manufacturing sector, the largest employers were the electrical equipment, chemical, machinery, and aerospace industries. In nonmanufacturing, large numbers worked in wholesale trade, communications, and in the engineering and architectural services industries.

In 1980, the Federal Government employed about 100,000 technicians, chiefly as engineering and electronics technicians, biological technicians, meteorological technicians, and physical science technicians. The largest number worked for the Department of Defense; most of the others worked for the Departments of Agriculture, Transportation, Interior, and Commerce.

State government agencies employed about 50,000 engineering and science technicians, and local governments about 13,500.

## Training, Other Qualifications, and Advancement

Although persons can qualify for technician jobs through many combinations of work experience and education, most employers prefer applicants who have had some specialized technical training. Specialized training is available at technical institutes, junior and community colleges, extension divisions of colleges and universities, and public and private vocational-technical schools. A few engineering and science students who have not completed the bachelor's degree and others who have degrees in science and mathematics also are able to qualify for technician positions.

Persons also can qualify for technician jobs by less formal methods. Workers may learn through on-the-job training, apprenticeship programs, or correspondence schools. Some qualify on the basis of experience gained in the Armed Forces. However, postsecondary training is becoming increasingly necessary for advancement to more responsible jobs.

Some of the types of postsecondary and other schools that provide technical training are discussed in the following paragraphs:

*Technical Institutes*. Technical institutes offer training to qualify students for a job immediately after graduation with a minimum of on-the-job training. In general, students receive intensive technical training but less theory and general education than they would in engineering schools or liberal arts colleges. A few technical institutes and community colleges offer cooperative programs in which students spend part of the time in school and part in paid employment related to their studies. Such practical work experience can be a decided advantage when seeking full-time employment as an engineering or science technician.

Some technical institutes operate as regular or extension divisions of colleges and universities. Other institutions are operated by States and municipalities, or by private organizations.

*Junior and Community Colleges*. Curriculums in junior and community colleges which prepare students for technician occupations are similar to those in technical institutes but emphasize theory and liberal arts. After completing the 2-year programs, some graduates qualify for technician jobs while others continue their education at 4-year colleges.

*Area Vocational-Technical Schools*. These postsecondary public institutions serve students from surrounding areas and emphasize training in skills needed by employers in the local area. Most require a high school degree or its equivalent for admission.

*Other Training*. Some large corporations conduct training programs and operate private schools to meet their needs for technically trained personnel in specific jobs; such training rarely includes general studies. Training for some technician occupations, for instance tool designers and electronic technicians, is available through formal 2- to 4-year apprenticeship programs. The apprentice gets on-the-job training under the close supervision of an experienced technician and related technical knowledge in classes, usually conducted after working hours.

The Armed Forces have trained many technicians, especially in electronics. Although military job requirements generally differ from those in the civilian economy, military technicians often find private or civilian government jobs with only minimal additional training.

Many private technical and correspondence schools often specialize in a single field of technical training, such as electronics. Some of these schools are owned and operated by large corporations that have the resources to provide up-to-date training in a technical field.

Those interested in a career as a technician should have an aptitude for mathematics and science and enjoy technical work. An ability to do detailed work with a high degree of accuracy is necessary; for design work, creative talent also is desirable. Technicians are part of a scientific team, and often work closely with engineers and scientists as well as other technicians and skilled workers. Some technicans, such as repair and maintenance technicians, should be able to work independently and to deal effectively with customers. Because technicians work with various tools and equipment, manual dexterity also is important.

Engineering and science technicians usually begin work as trainees in routine positions under the direct supervision of an experienced technician, scientist, or engineer. As they gain experience, they receive more responsibility and carry out a particular assignment under only general supervision. Technicians may eventually move into supervisory positions.

## Job Outlook

Employment opportunities for engineering and science technicians are expected to be favorable through the 1980's. Employment of technicians will grow faster than the average for all occupations. Opportunities will be best for graduates of postsecondary school technician training programs, particularly

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programs in which students gain practical work experience. Besides openings resulting from the growth in demand for technicians, numerous technicians will be needed to replace those who die, retire, or leave the occupation.

Industrial expansion and the increasing complexity of modern technology underlie the anticipated increase in demand for technicians. Many will be needed to work with the growing number of engineers and scientists in developing, producing, and distributing new and technically advanced products. Automation of industrial processes and the growing importance of environmental protection, energy development, and other areas of scientific research will add to the demand for technical personnel.

Employment of engineering and science technicians is sensitive to cyclical swings in the economy. During recessions, a decline in research and development funds, new product designs, and expenditures for other engineering and scientific activities may result in layoffs of some technicians. Until the economy recovers, hiring of new technicians is limited.

## Earnings

In private industry in 1979, technicians who completed a 2-year postsecondary school program earned starting salaries of about $11,600 a year, according to a survey by the Engineering Manpower Commission; those who did not complete a 2-year program started at about $10,100 a year. Graduates of 2-year programs with 5 years' experience earned about $14,300 a year in 1979, while nongraduates with some experience earned about $12,400. Senior technicians averaged about $22,300 a year in 1980, according to a Department of Labor survey.

Starting salaries for all technicians in the Federal Government were fairly uniform in early 1981. A high school graduate with no experience could expect $9,800 annually to start. With an associate degree, the starting salary was $11,000, and with a bachelor's, $12,300 or $15,200. With more experience, however, earnings are significantly higher. The average annual salary for all engineering technicians employed by the Federal Government in 1980 was $20,100; for physical science technicians, $18,100; and for life science technicians, $13,600.

## Related Occupations

Engineering and science technicians apply scientific principles in their work. Other technicians whose work activities involve the application of scientific principles include forestry technicians, broadcast technicians, drafters, surveying technicians, television and radio service technicians, computer service technicians, dental laboratory technicians, and medical technologists and technicians.

## Sources of Additional Information

For information on careers in engineering technology, contact:

Engineers Council for Professional Development, 345 East 47th St., New York, N.Y. 10017.

Information on schools offering technician programs is available from:

National Association of Trade and Technical Schools, 2021 K St. NW., Washington, D.C. 20006.

State departments of education also have information about approved technical institutes, junior colleges, and other educational institutions within the State offering postsecondary school training for specific technical occupations.

Other sources include:

American Association of Community and Junior Colleges, One Dupont Circle, Suite 410, Washington, D.C. 20036.

National Home Study Council, 1601 18th St. NW., Washington, D.C. 20009.

# Legal Assistants

(D.O.T. 119.267-026)

## Nature of the Work

In recent years, the demand for legal services has increased to a point where many lawyers are too busy to handle all of their work efficiently. In response to this problem, some lawyers have tried to free themselves from tasks that do not require a lawyer's expertise. Legal assistants, also called "paralegals" or "legal technicians," have made this possible. By using legal assistants, lawyers can provide legal services to more persons at less cost.

Legal assistants work directly under the supervision of a lawyer. While the lawyer always takes final responsibility for the legal assistant's work, a legal assistant is allowed to perform all the functions of a lawyer other than accepting clients, setting legal fees, giving legal advice, or presenting a case.

Legal assistants generally perform background work for the lawyer. For example, a legal assistant who helps a lawyer prepare a case for trial often investigates the facts of the case to make sure that all relevant information is known. The legal assistant then researches the appropriate laws, recorded judicial decisions, legal articles, and other material to determine whether the client has a good case. After analyzing all the information, the legal assistant prepares a written opinion on how the attorney should proceed. The attorney then decides how the case should be handled. If the attorney decides to bring a lawsuit for the client, the legal assistant may prepare legal arguments, file pleadings with the court, obtain affidavits, and assist the attorney during the trial. The legal assistant also may keep files of all documents and correspondence important to the case.

Besides trial-related work, legal assistants may help draft documents such as contracts, mortgages, separation agreements, and trust instruments for an attorney's clients. They may help prepare tax returns and plan estates. Some legal assistants coordinate the activities of law office employees and keep financial records for the law office.

Legal assistants who work for corporations help attorneys handle corporate matters such as employee contracts, shareholder agreements, stock option plans, and employee benefit plans. They may help prepare and file annual financial reports and secure loans for the corporation. Legal assistants also review

Legal assistants perform background research for lawyers.

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government regulations to make sure that the corporation operates within the law.

The duties of legal assistants who work for the Federal, State, or local government vary depending on the type of agency that employs them. Generally, legal assistants in government analyze legal material for internal use, maintain reference files, conduct research for attorneys, collect and analyze evidence for agency hearings, and prepare informative or explanatory material on the law, agency regulations, and agency policy for general use by the agency and the public.

Legal assistants employed in community legal service projects help the poor, the aged, and other persons in need of legal aid. They file forms, conduct research, and prepare documents. When authorized by statute, they may represent clients at administrative hearings.

Some legal assistants, usually those in small and medium-sized law firms, have varied duties. One day the legal assistant may be doing research on judicial decisions on improper police arrests and the next day may help prepare a mortgage contract. This requires a general knowledge of many areas of the law.

Most legal assistants—those who work for large, departmentalized law firms, government agencies, and corporations—specialize in one area of the law. Some specialties are real estate, estate planning, family law, labor law, litigation, and corporate law. Even within specialties, functions often are broken down further so that a legal assistant deals with one narrow area of the specialty. For example, legal assistants who specialize in labor law may deal exclusively with employee benefits.

## Working Conditions

Legal assistants do most of their work at desks in offices and law libraries. Occasionally, they travel to gather information and perform other duties. They may work alone or with others.

Most legal assistants work a standard 40-hour week. Sometimes, they work very long hours and are under pressure to meet deadlines. Usually they do not get paid for overtime work, although they may receive compensatory time off.

Legal assistants handle many routine assignments. Some find that these assignments offer little challenge and become frustrated with their duties. On the other hand, many lawyers assign more responsible tasks as the legal assistant gains experience. Furthermore, as new laws and judicial interpretations emerge, legal assistants are exposed to many new legal problems that make their work more interesting and challenging.

## Employment

In 1980, an estimated 36,000 persons worked as legal assistants. Private law firms employ the majority; most of these work for firms with 15 or more attorneys. Legal assistants are found in nearly every Federal Government agency; the Departments of Justice, Treasury, and Interior and the General Services Administration are the largest employers. State and local government and publicly funded legal services projects also employ legal assistants. Banks, real estate development companies, insurance companies, accounting firms, management consulting firms, manufacturing firms, and other corporate offices hire legal assistants.

## Training, Other Qualifications, and Advancement

Several methods of entry into the legal assistant profession are available. A few employers require only a high school diploma and train their legal assistants on the job. Some employers train other experienced legal personnel, such as legal secretaries, for legal assistant positions. Increasingly, however, employers require formal legal assistant training.

Several hundred formal programs in legal assistance are available from 4-year colleges and universities, law schools, community and junior colleges, business schools, proprietary schools, and a few law firms. The requirements for admission to these training programs vary widely. Some require some college or a bachelor's degree. Others accept high school graduates or persons with legal experience. A few schools require standardized tests and personal interviews.

Most legal assistant programs are completed in 2 years, although some take as long as 4 years. A few programs of very intensive instruction last only a few weeks. Some schools offer general legal assistant training with courses in many different areas of the law, including legal research techniques. Others provide training in specialized areas of the law, such as real estate, estate planning and probate, litigation, family law, and income taxation. Many legal assistant training programs include an internship in which students gain practical experience by working in a law office, corporate legal department, or government agency. Depending on the program, graduates may receive a certificate, an associate degree, or, in some cases, a bachelor's degree in legal assistance.

Some graduates of legal assistant programs enter other law-related occupations such as claims examiner, title examiner, and legal investigator.

Currently, legal assistants need not be certified. The National Association of Legal Assistants, however, has established standards for voluntary certification. Legal assistants who meet these standards are eligible to take a 2-day examination given by the Certifying Board of Legal Assistants. This examination is administered each year at several regional testing centers. Persons who pass this examination may use the designation Certified Legal Assistant (CLA).

All legal assistants must read, write, and speak well. They must handle legal problems logically and effectively communicate their findings and opinions to their supervising attorney. They must understand legal terminology and have good research and investigative skills. Legal assistants must always stay abreast of new developments in the law that affect their duties.

Because legal assistants often deal with the public and other employees, they must be courteous and uphold the high ethical standards of the legal profession. A few States have established ethical guidelines that legal assistants in the State must follow.

Experienced legal assistants usually are given progressively more responsible duties and are less closely supervised. In large law firms, corporate legal departments, and government agencies, experienced legal assistants may supervise other legal assistants and delegate work assigned by the attorneys. While advancement opportunities usually are limited, a few legal assistants are promoted to managerial positions.

## Job Outlook

Employment of legal assistants has grown tremendously since the emergence of this occupation in the late 1960's. Although the rate of growth should slow somewhat during the 1980's, employment still is expected to grow much faster than the average for all occupations. The emphasis on hiring legal assistants should continue in both legal and law-related fields so that the cost, availability, and efficiency of legal services can be improved. In addition to employment growth, numerous job openings will arise as persons leave the occupation for various reasons.

Private law firms will continue to be the largest employers of legal assistants as an increased population sustains the need for legal services. The growth of prepaid legal plans also should contribute to the demand for the services of law firms. Other organizations, such as corporate legal departments, insurance companies, real estate and title insurance firms, and banks, will continue to hire legal assistants. Job opportunities are expected to expand throughout the private sector as companies become aware of the value of legal assistants.

Legal assistants may find increased job opportunities in the public sector. Community legal services programs may provide greater assistance to the poor, the aged, minorities, and middle-income families. Because these programs operate on limited budgets, legal assistants will be used to keep expenses down without having to limit services. Federal, State, and local government agencies, consumer organizations, and the courts also should continue to hire legal assistants in increasing numbers.

While job openings for legal assistants are expected to increase significantly, so will the number of persons pursuing this career. As the number of graduates from legal assistant training programs rises, competition for jobs should increase. Still, job prospects for persons with formal legal assistant training are expected to be good throughout the 1980's.

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To a limited extent, legal assistant jobs are affected by the business cycle. During recessions, the demand for some discretionary legal services, such as planning estates, drafting wills, and handling real estate transactions, declines. Corporations are less inclined to initiate litigation when falling sales and profits lead to budgetary restrictions. As a result, legal assistants employed in offices adversely affected by a recession may be laid off. On the other hand, during recessions, individuals and corporations face other legal problems, such as bankruptcies and foreclosures, that require legal solutions. Furthermore, the continuous emergence of new laws and judicial interpretations creates new business for lawyers and legal assistants without regard to the business cycle.

## Earnings

Earnings of legal assistants vary greatly. Salaries depend on the training and experience the legal assistant brings to the job, the type of employer, and the geographic location of the job. Generally, legal assistants who work for large law firms or in large metropolitan areas earn more than those who work for smaller firms or in less populated regions.

According to an American Management Associations survey, starting salaries for legal assistants averaged around $15,100 a year in 1980. Salaries for legal assistants with 1-3 years' experience averaged $17,200, while those with 5-8 years' experience averaged $20,300.

Legal assistants hired by the Federal Government in early 1981 started at $12,300 or $15,200 a year, depending on their training and experience. The average annual salary of legal assistants who worked for the Federal Government in 1980 was about $21,800.

## Related Occupations

Several other occupations also call for a specialized understanding of the law and the legal system but do not require the extensive training of a lawyer. Some of these are abstractors, claims examiners, health and regulatory inspectors, legal investigators, occupational safety and health workers, patent agents, police officers, and title examiners.

## Sources of Additional Information

General information on a career as a legal assistant and a list of legal assistant schools approved by the American Bar Association are available from:

American Bar Association, Standing Committee on Legal Assistants, 1155 East Sixtieth St., Chicago, Ill. 60637.

For information on certification of legal assistants, contact:

National Association of Legal Assistants, Inc., 3005 East Skelly Dr., Suite 120, Tulsa, Okla. 74105.

Information on local training programs and job prospects is available from your local legal assistant association. A list of legal assistant associations can be obtained from:

National Federation of Paralegal Associations, P.O. Box 1410, Ben Franklin Station, Washington, D.C. 20044.

# Library Technicians and Assistants

(D.O.T. 100.367-018; 209.387-026; 222.587-014; 249.365-010, .367-046, and .687-014)

## Nature of the Work

Library technicians and assistants perform the many support activities involved in operating a library. They help professional librarians to acquire, organize, and make material accessible to users. Like librarians, technicians and assistants work either in technical or user services. Those in user services work directly with the public helping find the information needed. Those in technical services are primarily concerned with acquiring and preparing materials for use and deal less frequently with the public. Technicians' jobs usually are more responsible and less routine in nature than those of library assistants.

*Library technicians* (D.O.T. 100.367-018) are also known as *library technical assistants*. They answer questions about use of the card catalog, direct library users to standard references, perform routine cataloging of library materials, file cards in catalog drawers, verify information on order requests, and may supervise other support staff. Some library technicians operate and maintain audiovisual equipment such as projectors and tape recorders. They may also assist library users with microfilm or microfiche readers, or retrieve information from a computer data base. Technicians sometimes work on special projects. A technician with artistic ability, for example, might design posters and displays.

*Library assistants* (D.O.T. 249.367-046) may have other job titles, depending on the practice in the library where they work. They may be called *library clerks*, *library attendants*, *desk attendants*, *library helpers*, or *circulation clerks*. Assistants check books in and out, sort and shelve library materials, repair damaged books, and answer routine inquiries. They may keep current files of special materials, such as newspaper clippings and pictures. Assistants also do many routine tasks involved in purchasing and processing library materials.

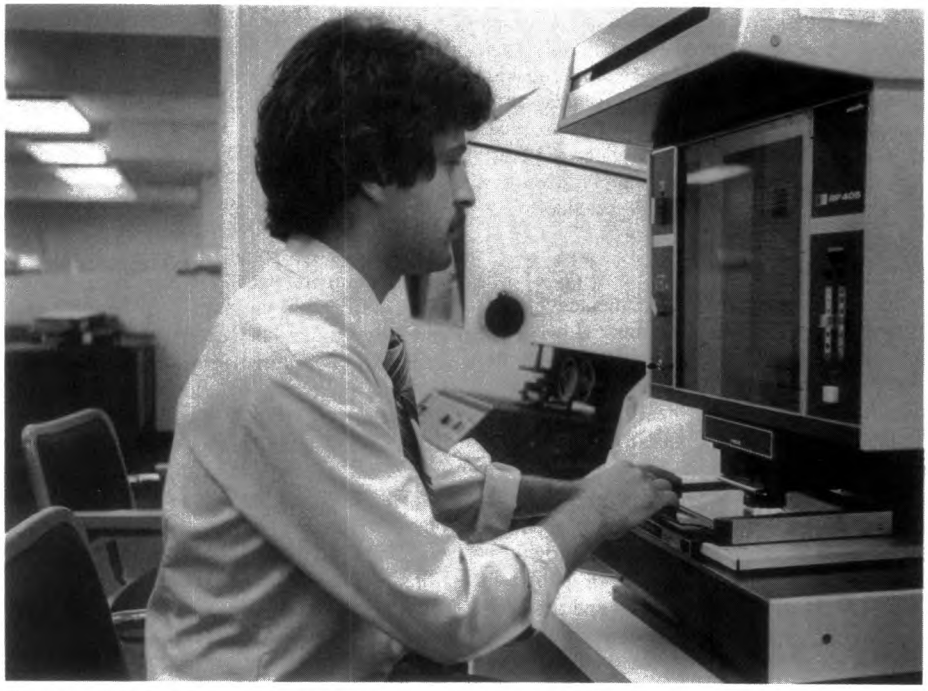
## Working Conditions

Library technicians and assistants work with people, books, numbers, and mechanical equipment. At times their jobs may be very repetitive—when calculating circulation statistics, for example. At other times, however, they may work on special projects such as designing posters and setting up displays. The job may require much standing, stooping, bending, lifting, and reaching.

Library technicians and assistants in government and other special libraries—such as those in business and law firms and research centers—usually work a regular 40-hour week, but those in public libraries and college and university libraries may work weekend and evening hours. In schools, library technicians and assistants work regular school hours.

## Employment

In 1980, 154,000 library technicians and assistants worked in libraries of every description; small libraries employed just one or



Library technician uses microfiche reader to retrieve information.

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two support personnel, while very large libraries employed hundreds.

In late 1980, the Federal Government employed about 4,400 library technicians. Most worked in Department of Defense libraries or in the Library of Congress.

## Training, Other Qualifications, and Advancement

A high school diploma is the usual requirement for a library assistant. However, some libraries may hire persons who have not completed high school to work as pages; these workers retrieve books from closed stacks and shelve returned books. As in most clerical occupations, typing ability is helpful. Some academic libraries require library assistants to have a bachelor's degree.

Although some individuals with high school education may find jobs as library technicians, most employers prefer people with at least some college. Post-high school education has become increasingly necessary as libraries with tight budgets seek technically trained individuals who are able to assume greater responsibilities and because the number of people with college training seeking library technician jobs has increased.

Although many library technicians are trained on the job, libraries encourage support staff members to take courses in library technology to improve their job skills.

In 1979, 116 institutions, mostly 2-year colleges, offered training for library technicians. Junior and community college programs generally lead to an associate of arts degree in library technology and include 1 year of liberal arts courses and 1 year of library-related study. Students study the purposes and organization of libraries, and how they operate. They learn to order, process, catalog, and circulate library materials. Some receive training in library automation. Many learn to produce audiovisual materials such as posters, transparencies and audio and video tapes and to use and maintain audiovisual equipment. Applicants should be aware that, credits earned in an associate degree library technology program do not apply toward a professional degree in library science.

## Job Outlook

Employment of library technicians and assistants is expected to grow more slowly than the average for all occupations through the 1980's. However, many library technicians and assistants will be needed annually to replace those who transfer to other fields, retire, or die.

Continued employment growth is expected in special libraries such as business, medical, and law libraries. Little or no growth is expected in school, academic, or public libraries because of tight budgets and a declining school age population. Some growth will result as technicians and assistants increasingly perform routine tasks formerly done by librarians.

## Earnings

Salaries for library technicians and assistants vary widely depending on the size of the library or library system as well as the geographic location and size of the community.

Salaries of library technicians in the Federal Government generally were between $10,963 and $15,193 in early 1981. Most library assistants earned between $8,951 and $9,766 during the same year.

## Related Occupations

Library technicians and assistants keep records, catalog, sort and shelve materials, and assist library users. Other occupations with similar duties include records management technicians, information specialists, receptionists, data processing control clerks, medical records technicians, customer complaint clerks, title searchers, insurance claims clerks, reservation clerks, secretaries, mail clerks, records custodians, and teacher aides.

## Sources of Additional Information

Information about a career as a library technician can be obtained from:

Council on Library/Media Technical Assistants, Wilbur Wright College Library, 3400 North Austin Avenue, Chicago, Illinois 60634.

For information on training programs for library-media technical assistants, write:

American Library Association, Office for Library Personnel Resources, 50 East Huron St., Chicago, Ill. 60611.

# Programmers

(D.O.T. 020.162-014, .167-018, .167-022, .187-010, .187-014; and 219.367-026)

## Nature of the Work

Computers can process vast quantities of information rapidly and accurately, but only if they are given step-by-step instructions to follow. Because the machines cannot think for themselves, computer programmers must write detailed instructions called programs that list in a logical order the steps the machine must follow to organize data, solve a problem, or do some other task.

Programmers usually work from descriptions prepared by systems analysts who have carefully studied the task that the computer system is going to perform—perhaps organizing data collected in a survey or estimating the stress on portions of a building during a hurricane. These descriptions contain a detailed list of the steps the computer must follow, such as retrieving data stored in another computer, organizing it in a certain way, and performing the necessary calculations. (A more detailed description of the work of systems analysts is contained elsewhere in the *Handbook*.) An applications programmer then writes the specific program for the problem, by breaking down each step into a series of coded instructions using one of the languages developed especially for computers.

Some organizations, particularly smaller ones, do not employ systems analysts. Instead, workers called programmer-analysts are responsible for both systems analysis and programming.

Programs vary with the type of problem to be solved. For example, the mathematical calculations involved in payroll accounting procedures are different from those required to determine the flight path of a space probe. A business applications programmer developing instructions for billing customers would first take the company records the computer would need and then specify a solution by showing the steps the computer must follow to obtain old balances, add new charges, calculate finance charges, and deduct payments before determining a customer's bill. The programmer then codes the actual instructions the computer will follow in a high-level programming language, such as COBOL.

Next, the programmer tests the operation of the program to be sure the instructions are correct and will produce the desired information. The programmer tries a sample of the data with the program and reviews the results to see if any errors were made. If errors did occur, the program must be changed and rechecked until it produces the correct results. This is called "debugging" the program.

Finally, an instruction sheet is prepared for the computer operator who will run the program. (The work of computer operators is described in the statement on computer operating personnel.)

Although simple programs can be written in a few hours, programs that use complex mathematical formulas or many data files may require more than a year of work. In some cases, several programmers may work together in teams under a senior programmer's supervision.

Applications programmers are usually business oriented, engineering oriented, or science oriented. A different type of specialist, the systems programmer, maintains the general instructions (called software) that control the operation of the entire computer system. These workers make changes in the sets of instructions that determine the allocation of the computer's resources among the various jobs it has been given. Because of their knowledge of operating systems, systems programmers often help applications programmers determine the source of problems that may occur with their programs.

## Working Conditions

Programmers work about 40 hours a week, but their hours are not always from 9 to 5. Once or twice a week programmers may report early or work late to use the computer when it is available; occasionally, they work on weekends. When a new program is being tested, programmers may get calls from computer operators asking for advice at all hours of the day or night.

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## Employment

In 1980, about 228,000 persons worked as computer programmers. Most were employed by manufacturing firms, data processing service organizations, government agencies, and insurance companies.

Many programmers work in large firms that need and can afford expensive computer systems. Small firms, which generally require computers only for payroll or billing purposes, often pay data processing service organizations to do this work. Small firms may maintain their own low-cost, small business computers. Systems programmers usually work in research organizations, computer manufacturing firms, and large computer centers.

## Training, Other Qualifications, and Advancement

There are no universal training requirements for progammers because employers' needs vary. Most programmers are college graduates; others have taken special courses in computer programming to supplement their experience in fields such as accounting or inventory control.

Employers using computers for scientific or engineering applications prefer college graduates who have degrees in computer or information science, mathematics, engineering, or the physical sciences. Graduate degrees are required for some jobs. Very few scientific organizations are interested in applicants who have no college training.

Although some employers who use computers for business applications do not require college degrees, they prefer applicants who have had college courses in data processing, who are experienced in computer operation or payroll accounting but who have no college training are promoted to programming jobs; however, they need additional data processing courses to become fully qualified programmers. Although it may be preferred, prior work experience is not essential for a job as a programmer; in fact, about half of all entrants to the occupation have little or no work experience.

Computer programming is taught at public and private vocational schools, community and junior colleges, and universities. Instruction ranges from introductory home study courses to advanced courses at the graduate level. High schools in many parts of the country also offer courses in computer programming.

An indication of experience and professional competence at the senior programmer level is the Certificate in Computer Programming (CCP). This designation is conferred by the Institute for Certification of Computer Professionals upon candidates who have passed a basic five-part examination. In addition, individuals may take another section of the exam in order to specialize in business, science, or systems applications.

In hiring programmers, employers look for people who can think logically and are capable of exacting analytical work. The job calls for patience, persistence, and the ability to work with extreme accuracy even under pressure. Ingenuity and imagination are particularly important when programmers must find new ways to solve a problem.

Programmers debug programs before they are run.

Beginning applications programmers usually spend their first weeks on the job attending training classes. After this initial instruction, they work on simple assignments while completing further specialized training programs. Programmers generally must spend at least several months working under close supervision before they can handle all aspects of their job. Because of rapidly changing technology, programmers must continue their training by taking courses offered by their employer and software vendors. For skilled workers, the prospects for advancement are good. In large organizations, they may be promoted to lead programmers and be given supervisory responsibilities. Some applications programmers may become systems programmers. Both applications programmers and systems programmers often become systems analysts or are promoted to managerial positions.

## Job Outlook

Employment of programmers is expected to grow faster than the average for all occupations through the 1980's as computer usage expands, particularly in firms providing accounting, business management, and computer programming services, and in organizations involved in research and development. In addition to jobs resulting from increased demand for programmers, many openings will arise each year from the need to replace workers who leave the occupation. Because many programmers are relatively young, few openings will result from retirements or deaths. However, many vacancies will be created as experienced workers transfer into jobs as systems analysts or managers.

The demand for applications programmers will increase as many more processes once done by hand are automated, but employment is not expected to grow as rapidly as in the past. Improved software, such as utility programs that can be used by other than data processing personnel, will simplify or eliminate some programming tasks. More systems programmers will be needed to develop and maintain the complex operating programs made necessary by higher level computer languages, as well as to link or coordinate the output of different computer systems.

Job prospects should be excellent for college graduates who have had computer-related courses, particularly for those with a major in computer science or a related field. The number of persons with computer skills is not expected to keep pace with rising demand. Graduates of 2-year programs in data processing technologies also should have good prospects, primarily in business applications.

## Earnings

Average weekly earnings of programmer trainees in private industry ranged from $250 to $330 in 1980, according to surveys conducted in urban areas by the Bureau of Labor Statistics and firms engaged in research on data processing occupations. In general, programmers earn about twice as much as the average earnings of all nonsupervisory workers in private industry, except farming. Systems programmers generally earn more than applications programmers, and lead programmers earn more than either systems or applications programmers. For example, experienced systems programmers averaged about

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$470 a week compared to $400 for applications programmers. Average weekly salaries for lead systems programmers were $505, compared to $430 for lead applications programmers. In the Federal civil service, the entrance salary for programmers with a college degree was about $200 a week in early 1981.

Programmers working in the North and West earned somewhat more than those working in the South. Those working for data processing services and public utilities had higher earnings than programmers employed in banks, advertising, or educational institutions.

## Related Occupations

Other workers in mathematics, business, and science who solve detailed problems include systems analysts, mathematicians, statisticians, engineers, financial analysts, actuaries, mathematical technicians, and operations research analysts.

## Sources of Additional Information

Additional information about the occupation of programmer is available from:

American Federation of Information Processing Societies, 1815 North Lynn St., Arlington, Va. 22209. Information about the Certificate in Computer Programming is available from:

The Institute for Certification of Computer Professionals, 35 E. Wacker Dr., Suite 2828, Chicago, Ill. 60601.

# Technical Writers

(D.O.T. 131.267-026)

## Nature of the Work

Technical writers put scientific and technical information into readily understandable language. They research, write, and edit technical materials and also may produce publications or sales or audiovisual materials. Technical writers use their knowledge of a technical subject area—laser beams or pharmacology, for example—along with their command of language and versatility of style to convey information in a way that is helpful to people who need it—scientists, engineers, technicians, mechanics and repairers, managers, sales representatives, and the general public. In addition to clarifying technical information, technical writers often use their writing skills in marketing, advertising, and public relations work.

Some organizations use job titles other than "technical writer." Depending on the employer, people in technical writing jobs may be called staff writers, publications engineers, communications specialists, industrial writers, medical writers, communicators, or instructional materials developers.

Technical writers instruct and inform through the use of written words. They prepare manuals, catalogs, parts lists, and instructional materials used by sales representatives to sell machinery or scientific equipment and by technicians to install, maintain, and service it. Instructional aids assist people who operate complex equipment—for example, technicians who monitor sophisticated diagnostic equipment in a hospital's coronary care unit. Many technical writers prepare manuals and training aids for military weapons and equipment. Sometimes technical writers write scripts for training films, or prepare instructional materials for self-teaching cassettes, filmstrips, or kits. Technical writers often are part of a team, working closely with scientists, engineers, accountants, and others.

Many technical writers prepare reports on research. They communicate research developments to other scientists, engineers, and technicians to help prevent duplication of effort and to speed scientific and technical progress. Hundreds of such progress reports may be sent from one company department to another each year. Technical writers also prepare detailed reports for government regulatory agencies. Some reports—environmental impact statements, for example—require such a detailed treatment of technical subjects that they are prepared primarily by scientists, with the assistance of technical writers.

Technical writers also may prepare proposals—requests for money or facilities to conduct projects, develop prototypes of new products, or do research. A team of technical writers usually writes the final proposal using technical information prepared by scientists and engineers and cost estimates from managers and accountants.

Technical writers may also write specifications; prepare speeches and news releases; edit and write technical books and journals; prepare articles for popular magazines; develop advertising copy, promotional brochures, and texts for exhibits and displays; and handle technical documentation. They also sometimes prepare annual corporate reports to stockholders.

Technical writers starting an assignment learn as much as they can about the subject within the time permitted. They study reports, blueprints, sketches, drawings, parts lists, specifications, mockups, and product samples to become familiar with product technologies and production methods. They also read technical journals; consult with engineers, scientists, and technicians who may have worked on a project; and examine the equipment. After they have assembled the information needed for the document, they draw up an outline which they will use to prepare a rough draft. The draft may undergo several revisions before being accepted in final form. Technical writers usually coordinate the preparation by technical illustrators, drafters, or photographers of tables, charts, illustrations, and other artwork for the document.

Established technical writers may work on a freelance basis or open their own agencies or consulting firms. Freelance technical writers sell their work to publishers, manufacturing firms, and advertising agencies. They usually are hired to complete specific assignments such as writing about a new product or technique.

## Working Conditions

Most salaried technical writers have structured work schedules but they sometimes work overtime when under pressure to meet publication deadlines. Freelance writers set their own hours and often work at home. Technical writers spend much of their time at their office desks, but acquiring and assembling information often require visits to libraries and the offices of information sources. Onsite inspection of scientific projects and other research may require travel.

## Employment

An estimated 25,000 technical writers and editors were employed in 1980. Many work for large firms in the electronics, aircraft and parts, chemical, pharmaceutical, and computer manufacturing industries. Firms in the energy, communications, and computer software fields also employ many technical writers, as do research laboratories.

Many technical writers work directly for business and trade publications; professional journals in engineering, medicine, physics, chemistry, and other sciences; and with publishers of scientific and technical books.

Medical writers inform health professionals and the public about discoveries and developments in health and medicine. They work in hospitals, drug firms, universities, medical associations, laboratories, publishing houses, public relations firms, and advertising agencies.

The rapidly growing information industry provides another area of employment for technical writers. Technical information centers run by major industrial firms and research laboratories and commercial firms that provide clients with access to computerized data bases employ technical information specialists to collect, process, and manage a vast amount of information. Technical writers are particularly well suited for these jobs because of their combination of technical and communications skills.

The Federal Government employs about 1,700 technical writers and editors in areas as diverse as the physical sciences, weapons development, agriculture, and health. About three-fourths work for the Department of Defense, writing manuals that keep military personnel informed on the construction, maintenance, and use of weapons and instruments. The Departments of Interior, Agriculture, and Health and Human Services, and the National Aeronautics and Space Administration also employ technical writers.

Technical writers are employed throughout the country but the largest concentrations are in the Northeast, Texas, and California.

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## Training, Other Qualifications, and Advancement

There are no rigid requirements for entry into the field. People having a variety of backgrounds find jobs as technical writers. Employers seek people whose education, work experience, and personal pursuits indicate that they possess both writing skills and appropriate scientific or technical knowledge. Knowledge of graphics and other aspects of publication production may be helpful in getting a job. An understanding of communications technology and computers is increasingly important.

A college degree is helpful, and many employers require it. Many employers prefer candidates with a degree in science or engineering, plus a minor or an advanced degree in English, journalism, or technical communications. Others emphasize writing ability. They look for candidates with degrees in journalism, Engiish, or the liberal arts and courses or practical experience in a technical field—computer science or biochemistry, for example.

Many employers consider only seasoned, experienced writers in filling vacancies. Some firms hire recent college graduates for writer trainee positions. People with backgrounds in science or engineering or with degrees in technical writing are often preferred. However, a degree in almost any field may be acceptable if the candidate has technical and communications skills. Beginners can develop experience and demonstrate their ability through unpaid writing for local weekly newspapers and student or technical journals. A portfolio of writing samples is invaluable when applying for a job.

Most technical writers do not enter the occupation directly from college. The majority work initially in other jobs, usually as technicians, scientists, or engineers. Some begin as research assistants, editorial assistants, or trainees in a company's technical information or advertising departments. In time, these people may assume writing duties and develop technical communication skills. When a flair for writing becomes evident, they may seek a technical writing position in the same company or find a writing job elsewhere.

Technical writers should be logical and intellectually curious. They must be accurate and able to organize a mass of detailed material. Persistence and patience are important because acquiring information is not always easy. Because they often are part of a team of scientists, engineers, and technicians, they should be able to work with others; this requires tact and a cooperative attitude. Technical writers sometimes work alone with little or no supervision, so they must be self-disciplined.

Freelance writers in particular must be self-starters. They must be disciplined, motivated, and good at budgeting both time and money in order to deal with periods when there is too much work—or not enough.

In 1980, about 10 colleges and universities offered bachelor's degree programs in technical communication, science or medical writing, science information, or technical journalism; a few had master's degree programs. Several community and junior colleges offered associate degree programs.

Programs in technical writing are interdisciplinary. Most are based in communications, journalism, or language and literature departments, and have close cooperation with the mathematics, engineering, and science departments. At most schools, about 30 percent of the courses are in communications. Courses include communication theory, writing and editing, layout and design, and graphics. From 25 to 40 percent are in science or technology, and the remainder are in the social sciences and humanities, foreign languages or electives. At many schools, internships in industry or government give technical writing students first-hand job experience.

Hundreds of other colleges and universities offer technical writing or related courses which are available to science and engineering students. Related courses in copy editing, publication design, graphic arts, typography, technical advertising, industrial communications, and proposal writing, for example, are also desirable because they broaden the publications background of writers, making them more valuable to prospective employers. Many engineering schools offer English courses to sharpen writing skills, and several have extensive course offerings in technical writing. Several schools of journalism offer courses in medical journalism.

Numerous special institutes, seminars, and workshops are available to bring experi-

Some technical writers work for defense contractors.

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enced technical writers up to date. These are sponsored by colleges and universities, technical communication consultants, or organizations that specialize in employee training and development.

Beginners often do library research for experienced technical writers and prepare drafts of reports. As they demonstrate their ability to write and organize information, they are given more responsibility. Experienced writers in companies with large technical writing staffs become technical editors or shift to administrative positions in the publications or technical information departments. The top job in technical writing is publications manager, in charge of producing all technical documents. The manager supervises not only the technical writers and editors, but also the staff responsible for illustrations, photography, reproduction, and distribution.

After gaining experience and contacts, some technical writers freelance or form their own firms. Some handle industrial publicity and technical advertising for corporate clients. Other technical communications firms write and produce catalogs, manuals, and brochures for the promotion of a new product. Some experienced technical writers conduct writing seminars in industry and government, and others teach at colleges or universities in addition to their regular jobs. Some technical writers freelance by becoming specialists in particular scientific or technical subjects. They sometimes prepare syndicated newspaper columns or articles for popular magazines.

## Job Outlook

Employment of technical writers is expected to increase about as fast as the average for all occupations through the 1980's. In addition to jobs created by increased demand, openings will result from the need to replace those who transfer to other occupations, retire, or die.

Demand for technical writers is expected to increase because of the continuing expansion of scientific and technical information and the continued need to communicate it to researchers, corporate managers, sales representatives, and technicians. With the increasing complexity of industrial and scientific equipment, more users will depend on the technical writer's ability to prepare precise but simple explanations and instructions. However, the tendency for many scientists and engineers to do their own writing may limit growth of technical writing jobs.

Expenditures for research and development (R&D) will continue to have a significant effect on job opportunities for technical writers. Their employment, like that of scientists and engineers, is linked to spending levels for research and for product development in areas such as national defense, energy development and conversion, medicine, environmental health and safety, and communications technology. Through the 1980's, R&D expenditures are expected to increase more rapidly than during the 1970's. If actual expenditures differ significantly from the levels anticipated, the outlook for technical writers would be altered.

Relatively few job openings are expected in the Federal Government, where the number of technical writers and editors employed has remained about the same since the late 1960's. Most vacancies will occur as the result of retirements or transfers to other jobs.

Employment opportunities will be best for experienced technical writers and for beginners who have both demonstrated writing ability and a scientific or technical background. Graduates of technical writing programs should be in particular demand. Competition for technical writing jobs will probably continue to be less keen than for writing and editing jobs in general.

## Earnings

Starting salaries for technical writers averaged $15,200 a year in 1980, according to a survey by the American Management Associations. Annual salaries of experienced technical writers generally ranged from $17,000 to $25,000, while those of editors ranged from about $21,000 to more than $31,000, depending upon their level of responsibility.

In the Federal Government, beginning technical writers with a bachelor's degree, including 15 semester hours in science, engineering, or computer science, were paid $12,266 a year in late 1980; those with superior academic records or 1 year's experience could start at $15,193 a year. In 1980, the average salary for technical writers in Federal agencies was around $25,800 a year.

Salaries of technical writers depend on education, experience, and ability to produce, as well as on the type, size, and location of their employer. Earnings generally are higher on the East Coast and in California. Freelancing can provide additional income, but freelance earnings depend on the writer's ability, reputation, and success in generating assignments. Prospective full-time freelance writers should be able to support themselves until they establish contacts in the publishing or scientific world and receive regular assignments.

## Related Occupations

Technical writers must make their writing clear and meaningful to their audiences. Other occupations in which writing ability is essential include specification writers, newspaper reporters and correspondents, translators, advertising copy writers, public relations workers, educational writers, fiction writers, biographers, and screen writers.

## Sources of Additional Information

For information on careers in technical writing and illustrating, contact:

Society for Technical Communication, Inc., 815 15th St. N.W., Suite 501, Washington, D.C. 20005. *Academic Programs in Technical Communication*, a listing of colleges and universities that offer programs in technical writing, is also available from the Society for $6.

For information on careers in business communication, contact:

American Business Communication Association, c/o University of Illinois, 100 English Building, 608 South Wright St., Urbana, Ill. 61801.

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# Marketing and Sales Occupations

Sales work offers a wide range of career opportunities. In some sales jobs, people are their own bosses, determine their own schedules, and have their earnings depend entirely upon their performance. Other jobs are more routine, with structured work schedules and regular pay. Supervisory positions in sales enable individuals to use their leadership and administrative abilities. Managers plan, organize, and coordinate retail, wholesale, insurance, real estate and other sales activities and supervise sales workers. In all kinds of sales work, opportunities are good for flexible or part-time working hours.

This section of the *Handbook* describes sales workers in retail trade, wholesale trade, manufacturing, insurance, real estate, and securities. Also discussed are automobile sales workers, automobile parts counter workers, models, travel agents, advertising workers, and cashiers. As the accompanying table indicates, retail trade sales workers is the largest marketing and sales occupation.

**Table 1. Employment in selected marketing and sales occupations, 1980**

| Occupation | Employment |
|---|---|
| Retail trade sales worker | 3,347,000 |
| Cashier | 1,592,000 |
| Wholesale trade sales worker | 1,085,000 |
| Store manager | 962,000 |
| Manufacturer's sales worker | 437,000 |
| Insurance sales agent | 327,000 |
| Wholesaler | 248,000 |
| Securities sales agent | 63,000 |
| Travel agent and accommodation appraiser | 52,000 |
| Automobile parts department manager | 47,000 |
| Real estate appraiser | 36,000 |

SOURCE: Bureau of Labor Statistics.

## Training, Other Qualifications, and Advancement

Training requirements for sales work are as varied as the work itself. For jobs selling standardized merchandise such as magazines, candy, cigarettes, and cosmetics, employers usually seek high school graduates and have experienced sales clerks train them on the job. In some large stores, they may also attend training courses. Those who sell complex products or services, such as electronic equipment or liability insurance, need substantial education and training. For some sales positions, employers seek college graduates with majors in science or engineering. For other jobs, employers seek college graduates with majors in any field, or individuals with comparable job experience, and train them on the job or in their own training programs. Many sales workers learn through years of on-the-job experience, often supplemented by home study, employer training, and college courses. Thus, a real estate agent may take university extension courses; a department store beauty counselor may participate in an industry-sponsored training program; and a jewelry sales worker may learn through years of observation and experience on the job.

Even in the most routine kinds of selling, a high school diploma is an asset to a beginner. Courses in business, marketing, and merchandising are particularly good preparation. Many high schools have work-study programs that allow students to work part time in local businesses while attending classes in retailing. The proportion of sales workers who are college graduates has risen rapidly, from about 12 percent in 1970 to 21 percent in 1980. This is due in part to a need for more highly trained workers in some jobs. It also reflects the fact that many more college graduates are seeking sales jobs.

Personal attributes are extremely important in sales occupations—more so than in many other jobs. Sales workers must be outgoing, enthusiastic, and persuasive. They have to be poised and at ease with strangers, and good at striking up a conversation and relating to other people. Success in sales takes initiative, energy, self-confidence, and self-discipline. Arithmetic skills are an asset. Sales workers often find their sales ability and product knowledge can be used in a variety of jobs. For example, a retail trade furniture sales worker may become a furniture manufacturers' sales representative.

## Job Outlook

Employment in most sales occupations is expected to rise about as fast as the average for all occupations through the 1980's. In addition to jobs resulting from growth, thousands of openings will occur each year as experienced workers transfer to other occupations, retire, or die.

## Earnings

For some jobs in sales, such as sales clerks, earnings are usually low—many pay at or only a little above the minimum wage. For others, such as wholesale and manufacturers' sales workers, and in insurance and securities sales, earnings can be as high as the average for professional workers such as accountants and engineers.

# Advertising Workers

(D.O.T. 050.067-014; 131.067-014; 141.031-010, .061-014, .018, .022, .067-010; 162.157-038; 163.167-010; 164.117-010, -014, .167-010; 247.137-010, .382-010, .387-010; 254.357-014; 259.357-018)

## Nature of the Work

Virtually every business—whether a "mom and pop" grocery store or a large corporation—advertises its products or services to attract customers. Nationwide, $50 billion were spent on advertising in 1980. On a small scale, advertising can be done in-house by one person; on a large scale, advertising requires people in many different jobs. Creative workers such as writers and artists develop and produce ads, while people with business ability coordinate the efforts of others and arrange to broadcast the ads on radio and television, publish them in newspapers or magazines, mail them directly, or post them on billboards.

**Jobs in Advertising Agencies**. Companies doing the advertising often do not produce the ads themselves. Instead, they engage advertising agencies to create the general idea for an advertising campaign, prepare the ads, and arrange for them to be printed, broadcast, or televised. Agencies produce almost all national newspaper, magazine, radio, and TV ads. The following are important occupations found in most agencies.

An *account executive* (D.O.T. 164.167-010) is in charge of the advertising for each of the agency's clients, or accounts. In small agencies, the owner or manager may act as account executive. Account executives determine the nature of the advertising to be produced for their clients, coordinate and review all the agency's activities involved in producing it, and maintain good relations between the agency and the client. Account executives usually handle one large account or several smaller accounts.

*Copywriters* (D.O.T. 131.067-014) write the text of ads, called copy, and scripts for radio and TV ads. Copywriters must be able to write persuasively and should have an excellent command of English. Good copywriting calls for creativity, imagination, and a sense of salesmanship.

*Art directors* (D.O.T. 141.031-010) are responsible for the visual appearance of ads, including the arrangement on the page, type style, photographs, and illustrations. Art directors often supervise those who lay out each ad, draw illustrations, and take photographs.

Some agencies employ *commercial or graphic artists* (D.O.T. 141.061-014, -022)

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to draw company trademarks, illustrations, and other parts of the ad that can't be produced with photographs or readily available typefaces. It is common, however, for much of this work to be handled by freelance commercial artists, who may contract work with many different agencies or companies. (See also statement on commercial and graphic artists and designers elsewhere in the *Handbook*.) Agencies also employ *layout artists* (D.O.T. 141.061-018), who set up printed ads for reproduction, arrange photographs and text for best effect, and select the size and type of print.

*Media directors*, *media buyers*, and their assistants (D.O.T. 162.157-038; 247.382-010) buy space or time for ads in the appropriate media, which are any of the forms of communication used for advertising, including newspapers, magazines, radio, television, and billboards. The media director must not only recommend the most effective media for each client's advertising campaign but also the most effective publications, TV or radio stations, or billboard location. Beginners often start in the media department doing research on the relative effectiveness of various media for each client.

*Production managers* and their assistants arrange to have the ad printed, filmed, or recorded. They often deal with other firms or with freelance workers, who do much of this work. This work is especially important in the case of producing TV advertisements, because there are high costs and exacting standards involved in producing even the simplest commercial.

*Marketing research workers* (D.O.T. 050.067-014) provide information on the age, sex, and income level of a product's potential buyers, and their shopping habits and preferences. This is used in planning advertising campaigns. They also evaluate the effectiveness of advertising campaigns after they begin. (See also statement on market research analysts elsewhere in the *Handbook*.)

**Non-Agency Jobs**. Although advertising agencies are the most visible employers of advertising workers, companies who undertake to do their own advertising and the media employ more advertising workers.

Most companies have a marketing department, headed by a marketing director who is in charge of selling its products. Advertising is just one aspect of the marketing effort, which also includes research on new product lines, packaging design, management of the sales force, direct mail campaigns, and other sales promotional efforts. In this department, the *advertising manager* (D.O.T. 164.117-010) recommends how much to spend on advertising, what goals the advertising should meet, and which advertising agency would be most effective. After selecting an agency, the advertising manager monitors and supervises the agency's efforts.

Some companies, especially large retail firms, produce their own advertising and have what amounts to an in-house advertising agency. They employ copywriters, art directors, layout artists, media directors, and others who perform much the same functions as those with similar titles in advertising agencies. Other companies engage an advertising agency to do most of their work, but employ advertising workers in-house to produce sales materials, brochures, and displays, and to perform other advertising related duties they prefer to handle within the company.

Newspapers, magazines, and radio and TV stations and networks employ *space or broadcast-time sales workers* (D.O.T. 254.357-014; 259.357-018) to call on advertisers and advertising agencies and persuade them to buy advertising space or time. As with all sales workers, these people must have sales ability. They must be familiar with the characteristics of the readers, listeners, or viewers of their media, as well as the merits of their publication or station. This position can be a good starting point for entry into the field and can lead to higher level jobs in the media as well as in agencies and with advertisers. In addition, some media employ advertising workers such as copywriters who help small advertisers prepare their ads.

## Working Conditions

The advertising field is highly competitive. Advertising workers often are under pressure to produce effective advertising and do not have as much job security as most other workers. Although advertising workers usually work regular hours, they may be expected to work overtime to meet deadlines.

## Employment

About 100,000 advertising workers were employed in advertising agencies in 1980; probably two or three times this number were employed in other industries. Many of the largest advertising agencies are located in New York City, where most national advertising is prepared. However, many agencies are in other large cities, especially Chicago, Los Angeles, and Detroit.

New York also is the center of the broadcasting and publishing industries, as well as the site of many corporate headquarters. Therefore it also has a concentration of non-agency advertising people. Although many smaller cities have some advertising workers connected with local media and retail firms, few advertising workers are employed in smaller towns and rural areas.

## Training, Other Qualifications, and Advancement

Because of the diversity of advertising work and types of employers, there is little agreement on the best preparation for an advertising job. Hiring practices are influenced by the employer's size and organizational structure. A bachelor's degree with a liberal arts, journalism, art, or business major is usually the minimum requirement. A major in advertising can be good preparation, but many employers do not consider this of any greater value than a liberal arts background, at least at the undergraduate level. Whatever the major field of study, it is important to develop good writing skills, especially for those who aim for jobs as copywriters.

Those with the master's degree in business administration are preferred for managerial or research-oriented jobs, as opposed to creative jobs such as copywriter or art director. A master's degree in advertising is also considered good preparation for many jobs.

Many employers believe that the ability to create ideas for effective ads is a flair that can't be taught. Therefore they often give preference to applicants who have had some experience in advertising-related jobs or extracurricular activities. Part-time jobs in an advertising agency or in the advertising department of a business are ideal, but very scarce. Because advertising is a form of selling, a sales job can provide valuable experience. Writing or selling ads for a college newspaper also is considered good experience.

Previous experience in journalism or other writing is useful for those who wish to be copywriters, while training and experience in business, marketing, finance, and economics is useful for business-oriented advertising jobs.

Beginning advertising workers often start doing media or marketing research. Those with artistic backgrounds may start as layout workers and those with writing skills, as copywriters. Some large employers have management training programs. Formal educational qualifications and seniority usually do not matter as much in advertising as in other fields. Advancement to account executive or other higher level job can be rapid for those with ability.

## Job Outlook

Employment of advertising workers is expected to increase about as fast as the average for all occupations through the 1980's. Economic growth will mean additional products and services that need to be advertised, while population growth will increase the number of potential customers. However, employment growth is tied closely to the health of the economy. In a recession, some advertisers reduce advertising expenditures, which results in layoffs. Unlike the situation in many other industries where layoffs affect primarily production workers, advertising layoffs affect those in all levels. A highly paid account executive and an inexperienced layout worker both can be fired if an agency loses a large account or an advertiser cuts its ad budget. People who have been laid off, however, eventually find another advertising job.

## Earnings

Earnings in advertising vary depending on experience and individual ability. Based on limited data, beginning advertising workers

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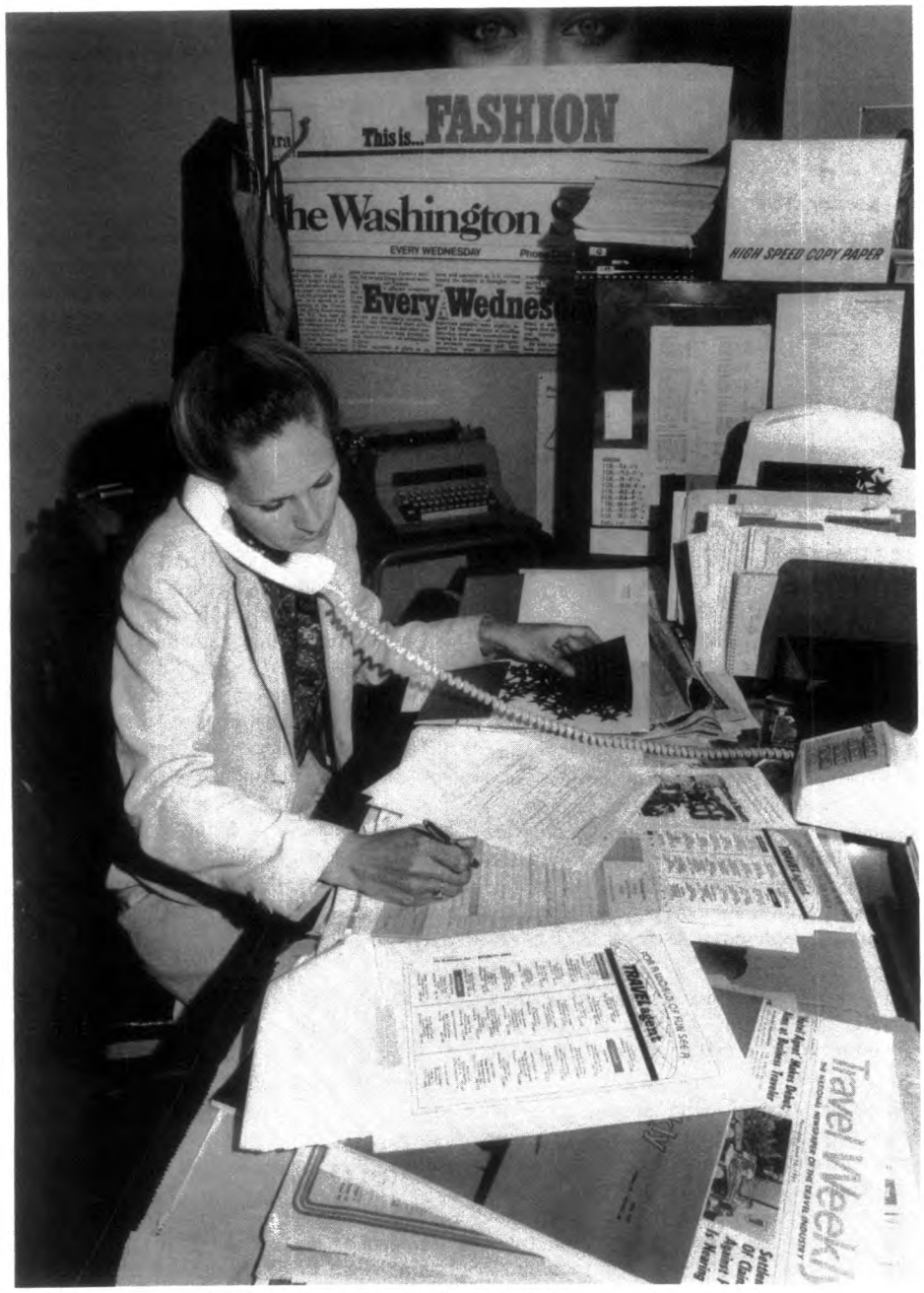


Advertising worker buying newspaper advertising space.

generally started at $10,000-$18,000 a year in 1980, although those with an MBA or an MA in advertising from a leading university often started at $18,000-$25,000 per year. Within 3 or 4 years most workers can expect to earn roughly $18,000-$25,000 a year. Earnings of account executives with 5 to 10 years' experience averaged between $25,000 and $40,000 a year in 1980. Senior executives and highly talented individuals often make much more.

## Related Occupations

Advertising and sales occupations are highly interrelated. Sales occupations which involve considerable persuasion and product demonstration include automobile sales workers, insurance agents and brokers, manufacturers' sales workers, sales managers, real estate agents and brokers, and wholesale trade sales workers. Also related to advertising workers are buyers, public relations workers, and occupations such as journalist which involve writing.

## Sources of Additional Information

For information on careers in the advertising field, send a stamped, self-addressed envelope to:

American Advertising Federation, 1225 Connecticut Ave. NW., Washington, D.C. 20036.

For information on advertising agency careers, contact:

American Association of Advertising Agencies, 666 Third Ave., New York, N.Y. 10017.

# Automobile Parts Counter Workers

(D.O.T. 185.167-038 and 279.357-062)

## Nature of the Work

Periodically, parts for cars, vans, trucks, and other motor vehicles must be replaced to keep them in proper working condition. Selling these replacement parts as well as accessories is the job of the automobile parts counter worker.

Most automobile parts counter workers are employed in wholesale and retail automobile parts stores and automobile dealerships. Those in wholesale and retail parts stores sell parts for many makes and models of vehicles. Their customers include independent repair shops, service stations, self-employed mechanics, and "do-it-yourselfers." Counter workers employed in dealerships handle parts for the makes of vehicles sold by the dealers and spend most of their time supplying parts to the mechanics in the dealers' repair shops.

Parts stores and dealerships stock thousands of items ranging from carburetors to rearview mirrors. Parts counter workers must be able quickly to identify and locate any of these parts for their customers, even when customers provide only a general description of the items they want. This requires a good knowledge of parts catalogs and the layout of the stockroom.

After getting parts for customers, counter workers use price lists to determine their cost, fill out sales receipts, and collect payment or file the charge on the customer's account.

When counter workers do not have in stock the part a customer wants, they may check for interchangeable parts. If none is available, counter workers may place a special order with their supplier or refer the customer to another dealer or parts store.

If customers are not sure what is wrong with their vehicle, counter workers may advise them as to which parts need to be replaced. Counter workers also keep parts catalogs and price lists up to date, replenish stock, and unpack incoming shipments. They also may take care of the paperwork involved in selling, such as recording sales and taking inventories. In some firms, particularly small wholesale stores, counter workers also repair parts.

Automobile parts managers supervise and train counter workers, order parts from suppliers, keep sales records, and verify cash receipts. In most automobile parts departments and stores, managers spend some of their time selling parts.

## Working Conditions

Automobile parts counter workers usually work in clean and well-lighted stockrooms. The work is not physically strenuous, but they spend much time standing or walking. Because many customers find it convenient to shop on weekends, some counter workers must work on Saturday and Sunday. Counter

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Since they deal with the public, parts counter workers should be friendly and tactful.

workers may have to rush during busy times and sometimes must deal with difficult customers.

## Employment

About 105,000 persons worked as automobile parts counter workers in 1980. Most worked for automobile dealers and retail automobile parts stores. Others worked for wholesalers and distributors of automotive parts. Trucking companies and buslines also employ parts workers to maintain their stockrooms and dispense parts to mechanics who repair their fleets; however, these workers usually do not sell parts to customers.

Because dealerships and automobile parts stores are located throughout the country, parts counter workers are employed in almost every town and city. Most who work for warehouse distributors, trucking companies, and buslines are employed in large cities.

## Training, Other Qualifications, and Advancement

Many parts counter workers learn the trade on the job. Beginners usually start as parts deliverers or trainees. In some firms, beginners work as stock or receiving clerks. (See statements on stock clerks and receiving clerks elsewhere in the *Handbook*.) By filling out order forms and restocking shelves, trainees gradually become familiar with the different types of parts, the use of catalogs and price lists, and the layout of the stockroom. Although trainees may wait on customers after a few months' experience, it generally takes about 2 years to learn every aspect of the job.

Generally, employers prefer to hire high school graduates who have some knowledge of automotive mechanics and parts, as well as mathematical ability. Courses in automotive mechanics, commercial arithmetic, merchandising, selling, and bookkeeping are helpful. Practical experience gained by working in a gasoline service station, automobile repair shop, or on vehicles as a hobby also is helpful.

Since they often deal with the public, automobile parts counter workers should be neat, friendly, and tactful. A good memory and the ability to write legibly and concentrate on details also are important.

Counter workers with supervisory and business management ability may become parts department managers or store managers. Others who are especially good at dealing with people may become outside sales representatives for parts wholesalers and distributors. These people sell parts to automobile repair shops, service stations, trucking companies, and other businesses that buy parts and accessories on a regular basis. Some counter workers open their own automobile parts stores.

## Job Outlook

Employment of automobile parts counter workers is expected to increase about as fast as the average for all occupations through the 1980's. More workers will be needed to supply parts for the growing number of motor vehicles in use.

Besides jobs arising from growth in demand, many openings are expected to be created because of the need to replace experienced workers who retire, die, or transfer to other occupations. Employment in this occupation is not expected to fluctuate significantly from year to year because the demand for automobile parts, unlike some products, is not very sensitive to changing economic conditions. Regardless of how tight family budgets may become during a recession, replacements must be purchased for broken automobile parts if the vehicle is to be restored to safe operating condition. Replacement of worn parts during routine maintenance can sometimes be deferred, but only at the risk of later, more expensive repairs, inconvenient breakdowns, or even an accident. In addition, during downswings in the economy people are more likely to replace parts and repair older automobiles rather than take on the much greater financial burdens required to replace the vehicle with a newer one. Thus, because sales of automobile replacement parts remain fairly stable regardless of the level of economic activity, layoffs of parts counter workers are rare.

## Earnings

Automobile parts counter workers typically work 40 to 48 hours a week. They may be paid a weekly or monthly salary or at an hourly wage rate. In addition, they may receive commissions on sales. Counter workers employed by automobile dealers in 23 large cities had estimated average earnings of $6.90 an hour in 1980, about the average for all nonsupervisory workers in private industry, except farming. Automobile parts managers—particularly store managers—had higher earnings. Many were paid a salary with sales incentives rather than an hourly wage.

Some parts counter workers are members of the following unions: The International Association of Machinists and Aerospace Workers; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.).

## Related Occupations

Receiving automobile parts shipments, storing parts in their proper places, and then issuing them to customers are important aspects of the automobile parts counter worker's job. Workers in many other occupations also receive, store, and issue supplies, merchandise, or equipment. Examples are inventory clerks, material clerks, property clerks, shipping and receiving clerks, stock clerks, and tool-crib attendants.

## Sources of Additional Information

Details about employment opportunities may be obtained from local automobile dealers and parts wholesalers and distributors, locals of the unions previously mentioned, or the local office of the State employment service.

For general information about the occupation, write to:

Automotive Service Industry Association, 444 N. Michigan Ave., Chicago, Ill. 60611.

National Automobile Dealers Association, 8400 Westpark Dr., McLean, Va. 20212.

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# Automobile Sales Workers

(D.O.T. 273.353-010)

## Nature of the Work

The automobile plays an essential role in the lives of most Americans. People use their cars to commute to work, to pick up their children from school, to go on vacation, and for various other purposes depending on their needs. When choosing a car that will meet their needs as well as their personal tastes, car buyers often need assistance. Automobile sales workers provide this assistance.

When a customer enters the showroom, the sales worker tries to find out what kind of car the customer wants. Is the customer interested primarily in economy or in a high-performance automobile? Sales workers emphasize the points that please their customers. To demonstrate these points, such as performance, ride, and handling, customers may test-drive cars. Most people want to bargain over the price of cars or the allowance they get for trade-ins, and some dealers expect sales workers to negotiate, especially if they are overstocked that month. A sales worker generally knows what price the dealer will accept, but no sale is final until the manager approves the terms the sales worker has offered.

The final step of overcoming the customers' hesitancy to buy and getting the order (closing the sale) is difficult in any sales work. Because cars are such an expensive purchase, experienced sales workers or managers often assist beginners in closing a sale.

Once the sale is made, the car must be registered and license plates obtained from the State department of motor vehicles. Sales workers fill out the necessary forms and, if customers desire, arrange for financing and insurance as well. Finally, sales workers set up a delivery date for the cars and answer any additional questions buyers have.

Successful sales workers always seek to develop customer loyalty and in this manner build repeat business. Therefore, after delivery, they often contact customers to thank them for their business and to ask if they are satisfied with the car. From time to time, they also may send customers literature on new models.

Successful sales workers cannot simply wait for prospects to walk into the showroom. Instead, they must follow leads on prospective customers by obtaining names of prospects from automobile registration records and from dealer sales, service, and finance records. They also can get leads from gas station operators, parking lot attendants, and others whose work brings them into frequent contact with car owners. After obtaining their leads, sales workers may contact prospects by phone or mail.

## Working Conditions

Although automobile sales workers stand much of the time, their job is not physically strenuous. They spend most of their time waiting on customers in well-lighted, well-heated, and well-ventilated showrooms.

For the convenience of their customers, automobile sales workers frequently work evenings, weekends, and holidays. Many dealers assign sales workers "floortime"—hours they spend in the showroom greeting customers. For example, a sales worker may be in the showroom from 9 a.m. to 3 p.m. one week, from 3 p.m. to 9 p.m. the next week, and all day on Saturdays. When not in the showroom, they may deliver cars and look for new customers a few hours each day.

Due to the highly competitive nature of selling, automobile sales workers may be subject to stress. They often are under pressure to meet their sales quota yet must remain pleasant even when they are tired or waiting on hard-to-please customers.

## Employment

An estimated 157,000 persons worked as automobile sales workers in 1980. Many small used-car dealerships employ only one sales worker, while some new car dealerships employ more than 50 sales workers and sell thousands of cars a year.

Most automobile sales workers work in heavily populated areas.

Sales workers should be good at striking up conversations with strangers.

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## Training, Other Qualifications, and Advancement

Sales managers and experienced sales workers train most beginners on the job. In large dealerships, beginners may receive several days of classroom training to learn how to obtain leads on prospective customers, to make sales presentations, and to close sales. In addition, manufacturers furnish training manuals and other educational material for sales workers to study. In almost every dealership, managers continually guide and train sales workers, both on the job and at periodic sales meetings. Sales managers also may attend the training programs which manufacturers offer for new sales campaigns.

A high school diploma usually is the minimum educational requirement for beginners. Courses in English or public speaking, in particular, can help build confidence in one's ability to talk with customers. Also, courses in mathematics, consumer education, merchandising, business law, and psychology can provide a good background for this type of work. Previous sales experience or other work requiring contact with the public is not required, but it is helpful. Many persons in automobile sales, for example, previously were in furniture, appliance, or door-to-door sales.

Since automobiles are a major purchase, dealers prefer sales workers who exhibit the maturity which can inspire customer confidence. As a result, many employers prefer applicants who are at least in their mid- or late twenties.

The success of automobile sales workers often depends upon their ability to gain the respect and trust of their customers. Therefore, they must be tactful, well-groomed, and able to express themselves well. Auto sales workers, like other sales workers, must have the drive and motivation to contact prospective customers, the ability to plan and organize an effective sales presentation, and an in-depth knowledge of their product and related matters, including automobile financing and insurance. Because automobile sales workers occasionally work for days without making a sale, they need self-confidence and determination to get through these slow periods.

Employees who have managerial ability may advance to assistant sales manager, sales manager, or general manager. Many prefer to remain sales workers, however, and enjoy the freedom of changing dealerships or working in different parts of the country. Some managers and general managers open their own dealership or become partners in dealerships.

## Job Outlook

Employment of automobile sales workers is expected to grow faster than the average for all occupations through the 1980's as the demand for automobiles increases. In addition to jobs resulting from growth in demand for sales workers, thousands of openings will occur annually as workers transfer to other occupations, retire, or die.

Over the long run, rising population and personal incomes will lead to increased car sales, and employment of sales workers will grow. Because sales are affected by changing economic conditions and consumer preferences, employment will fluctuate from year to year. Opportunities for beginners will be plentiful in some years but scarce in others. In lean years, workers with poor sales records may be laid off, or may find jobs in other fields. Many, however, return to selling when the demand for cars increases.

## Earnings

Most automobile sales workers are paid a commission, that is, a percentage of either the price of every car they sell or the profit the dealer makes on each sale. They may earn another commission when customers finance or insure their cars through the dealer. Because car sales vary from month to month, sales workers' commissions also vary. Many dealers pay commissioned sales workers a modest weekly or monthly salary so that they will have a steady income. Others give sales workers advances against future commissions. A few dealers pay a straight salary. Because it takes some time for beginners to learn the business, dealers often guarantee them a modest salary for the first few weeks or months.

Automobile sales workers averaged about $18,000 a year in 1980, according to the limited information available. Top sales workers earned considerably more. Earnings varied widely depending on individual ability and experience, geographic location, and the type and size of the dealership.

Many dealerships, especially the larger ones, also provide bonus and other special incentive programs for selling more cars than expected.

Sales workers receive many fringe benefits. Dealers often furnish their sales staffs with demonstrator cars free of charge, or sell or lease demonstrators at a discount. Sales workers also receive discounts on cars they buy for personal use.

## Related Occupations

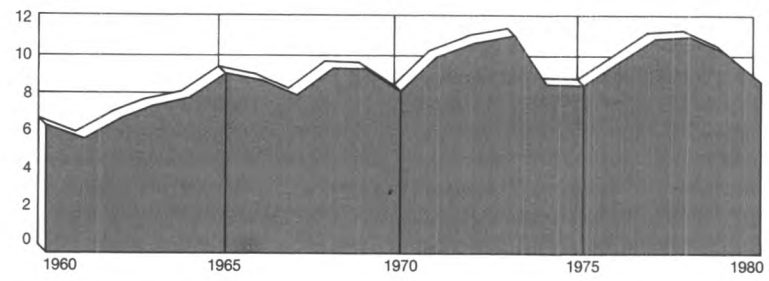
Sales play an important part in marketing many products and services. Among the many sales occupations that require personal contact and a special knowledge of the product or service being sold are insurance agents, manufacturers' sales workers, real estate agents, recreation and sporting goods sales workers, securities sales workers, shoe sales workers, stereo equipment sales workers, and travel agents.

## Sources of Additional Information

Details on employment opportunities may be obtained from local automobile dealers or the local office of the State employment service. For general information about the work, write to:

National Automobile Dealers Association, 8400 Westpark Dr., McLean, Va. 22102.

**Auto sales fluctuate from year to year, causing jobs for automobile sales workers to be abundant in some years and scarce in others**




Source: Motor Vehicle Manufacturers Association

# Cashiers

(D.O.T. 211 .362-010, .367-010, .462, .467, .482, and 249.467-010)

## Nature of the Work

Supermarkets, movie theaters, and restaurants are among the many businesses that employ cashiers to handle payments from customers. Most cashiers receive money, make change, fill out charge forms, and give receipts. The related occupation of bank teller is discussed elsewhere in the *Handbook*.

In addition to these duties, cashiers, depending on their place of employment, may do other work and have different job titles.

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Those employed in theaters, for example, are often called *box office cashiers* or *ticket sellers*. They operate ticket-dispensing machines and answer telephone inquiries. Restaurant cashiers, sometimes called *cashier checkers*, may handle reservations for meals and special parties, type menus, or sell items at the candy and cigarette counter. In supermarkets and other self-service stores, cashiers known as *checkout clerks, checkers*, or *grocery clerks* wrap or bag purchases. They also may restock shelves and mark prices, rearrange displays of merchandise, and take inventory. In many offices, cashiers, known as *agency* or *front-office cashiers*, type, operate the switchboard, do bookkeeping, and act as receptionists.

Cashiers operate several types of machines. Many use cash registers that print the amount of the sale on a paper tape. A rapidly growing number of cashiers operate electronic registers, computerized point-of-sale registers, or computerized scanning systems. Depending upon its complexity, a computerized system may automatically calculate the necessary taxes and record inventory numbers and other information. Such registers are replacing less versatile, conventional models in many stores. Cashiers who work in hotels and hospitals use machines that record charges for telephone, medical, and other services and prepare itemized bills. Cashiers may also operate adding and change-dispensing machines.

## Working Conditions

Most cashiers work indoors, often in small booths or behind counters located near store entrances. They may have to stand for long periods of time. In some cases, they are exposed to cold drafts in the winter and considerable heat during the summer.

## Employment

In 1980, about 1,600,000 persons worked as cashiers. More cashiers work in supermarkets and other foodstores than in any other kind of store. However, cashiers are needed in businesses and organizations of all types and sizes, and many find jobs in department stores, drugstores, shoestores, hardware stores, furniture stores, and other kinds of retail stores. Restaurants, hotels, theaters, schools, and hospitals also employ a large number of cashiers. Businesses employing cashiers are located in large cities, suburban shopping centers, small towns, and rural areas. The Federal Government employs a small number, primarily in the Department of Defense, in clubs, cafeterias, and exchanges on military installations.

Opportunities for part time work are very good. Nearly half of all cashiers work part time; about 1 in 4 is a student.

## Training, Other Qualifications, and Advancement

Employers prefer beginning cashiers with high school diplomas. Although there are no specific educational requirements, courses in business arithmetic, bookkeeping, typing, and other business subjects are good preparation for cashier jobs. Cashier training is offered as part of many public school vocational programs.

Many employers offer on-the-job training for cashiers. In a small firm, the beginner is trained on the job by an experienced worker. In large firms, cashier training programs often include classroom instruction in the use of electronic or computerized registers and in other phases of cashier's jobs. Many persons enter cashier positions without significant prior work experience. For some jobs, however, employers seek persons who have special skills or business experience, such as typing or selling. Many openings, especially full time positions, are filled by promoting qualified part time workers already employed by the firm.

Persons who want to become cashiers should be able to do repetitious work accurately. They need finger dexterity, a high degree of eye-hand coordination, and an aptitude for working with figures. Because they meet the public, cashiers should be neat in appearance and able to deal tactfully and pleasantly with customers.

Promotion opportunities for cashiers tend to be limited. However, the cashier's job affords a good opportunity to learn an employer's business and so may serve as a steppingstone to a more responsible job, such as bookkeeper or manager. Cashiers working in chainstores and other large retail businesses, for example, may advance to department or store managers.

## Job Outlook

Many job openings for cashiers are expected through the 1980's. The occupation is large, and employment is expected to grow faster than the average for all occupations. Growth in eating and drinking places, particularly in fast food chains, is expected to be especially rapid. However, even more openings will occur as cashiers transfer to other occupations or leave the labor force. Opportunities for part-time employment are also expected to continue to be very good.

Employment of cashiers is likely to be affected by the use of computerized checkout systems, which are beginning to replace cash registers in some supermarkets. An optical or magnetic scanner transmits the code number (Universal Product Code-UPC) of each purchase to a computer that is programmed to record a description and price of the item, add the tax, and print out a receipt. The computer also keeps track of the store's inventory and places orders with the warehouse when stock is needed. The widespread adoption of automated checkout systems in supermarkets and other establishments is expected to slow employment growth of cashiers and other workers. However, resistance from consumer and labor groups may limit the adoption of such systems. Employment in the supermarket industry is not very sensitive to fluctuations in the economy, since people must eat whether they have a job or not.

Cashiers may have to stand for long periods of time.

## Earnings

Beginning cashiers often earn only the minimum wage required by law. In establishments covered by the Federal law, the minimum was $3.10 an hour in 1980. In addition, minimum wages in many establishments are governed by State law. Where State minimums are higher, the establishment pays at least that rate. Cashiers earn wages ranging from the minimum in a given establishment to several times that amount. According to a 1981 Bureau of Labor Statistics survey of grocery stores, the top median hourly union rates for full-time cashiers ranged from $4.93 to $8.79. Wages tended to be highest in the West and the North Central region and lowest in the South; wages generally were higher in large metropolitan areas than in smaller cities.

Experienced full-time cashiers who were members of the United Food and Commercial Workers International Union earned average wages of $8.45 per hour in 1980; beginners earned average wages of $4.64 per hour. Wages for nonunion cashiers are generally lower than those for union cashiers.

Many cashiers are members of the United Food and Commercial Workers International Union. Others are represented by a variety of unions, depending on the industry in which they work. They generally receive health insurance, annual and sick leave, pension benefits, and similar benefits available to other workers.

Hours of work for cashiers may vary depending on needs of the employer. Cashiers often work during rush periods such as holidays, weekends, late afternoons, and evenings. Work at these times often is required in theaters, restaurants, and foodstores. Many cashiers in these places work part time

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or on split shifts. Full-time cashiers in supermarkets and other large retail stores usually work a 5-day, 40-hour week; however, they may work on weekends and have time off during the week.

### Related Occupations

Cashiers pay or receive money and keep account of such exchanges. Other workers with similar duties include bank tellers, ticket sellers, post office clerks, toll collectors, sales clerks, and adding-machine operators.

### Sources of Additional Information

Details about employment opportunities are available from local businesses and the local office of the State employment service.

# Insurance Agents and Brokers

(D.O.T. 250.257-010)

### Nature of the Work

Most people have their first contact with an insurance company through an agent or broker. When individuals or companies decide to buy insurance, they get in touch with one of these professionals to help them select the right policy for their needs. Insurance agents and brokers sell policies that provide individuals and businesses with financial protection against loss. They plan for the financial security of individuals, families, and businesses; advise about insurance protection for an automobile, home, business, or other property; prepare reports and maintain records; or help a policyholder obtain settlement of an insurance claim. Specialists in group policies may help an employer to set up payroll deductions for employees covered by the policy.

Insurance agents are insurance company employees; brokers are independent business persons who sell for many insurance companies and place policies directly with the company that best meets a clients' needs. Otherwise, agents and brokers do much the same kind of work.

Agents and brokers sell one or more of the three basic types of insurance: Life, property-liability (casualty), and health. Life insurance agents, sometimes called life underwriters, offer policies that pay survivors when a policyholder dies. Depending on the policyholder's circumstances, a life policy also can be designed to provide retirement income, funds for the education of children, or other benefits. Casualty insurance agents sell policies that protect individuals and businesses from financial losses as a result of automobile accidents, fire or theft, or other losses, as well as industrial or commercial lines, covering workers' compensation, product liability, or medical malpractice. Many life and casualty agents also sell health insurance policies covering the costs of hospital and medical care or loss of income due to illness or injury. Many agents may also advise clients about securities, such as mutual fund shares or variable annuities.

### Working Conditions

Agents do a considerable amount of local travel to meet with clients. They generally arrange their own hours of work, and often schedule evening and weekend appointments for the convenience of clients. Some agents work more than 40 hours a week.

### Employment

More than 325,000 agents and brokers sold insurance in 1980, thousands of whom worked part time. About one in four is self-employed. Many agents and brokers specialize in life insurance or in property-liability insurance. A growing number of agents (called multiline agents) offer both life and property-liability policies.

Agents and brokers are employed in cities and towns throughout the country, but most work in or near large population centers. Almost all insurance agents and brokers work out of local company offices or independent agencies.

### Training, Other Qualifications, and Advancement

Although many employers prefer college graduates for jobs selling insurance, most hire high school graduates with potential or proven sales ability or those who have been successful in other types of work. Many colleges and universities offer courses in insurance, and some schools offer a bachelor's degree in insurance. College courses in finance, accounting, economics, business law, government, and business administration enable the insurance agent to relate insurance to other personal finance problems and to economic conditions. Courses in psychology, sociology, and public speaking can prove useful in improving sales techniques. College training may help the agent grasp the fundamentals and procedures of insurance selling more quickly.

All agents and most brokers must obtain a license in the State where they plan to sell insurance. In most States, licenses are issued only to applicants who pass written examinations covering insurance fundamentals and the State insurance laws. Agents who plan to sell mutual fund shares and other securities also must be licensed by the State. New agents usually receive training at the agencies where they work and frequently also at the insurance company's home office. Beginners sometimes attend company-sponsored classes to prepare for examinations. Others study on their own and accompany experienced sales workers when they call on prospective clients.

Agents and brokers can broaden their knowledge of the insurance business by taking courses at colleges and universities and attending institutes, conferences, and seminars sponsored by insurance organizations. The Life Underwriter Training Council (LUTC) awards a diploma in life insurance marketing to agents who successfully complete the Council's 2-year life program. This program emphasizes practical selling skills. There is also a course in health insurance. The National Association of Health Underwriters awards the Registered Health Underwriter (RHU) designation to those individuals who successfully complete a series of courses. Life insurance agents or brokers can qualify for the Chartered Life Underwriter (CLU) designation by passing a series of examinations given by the American College of Bryn Mawr, Pa; property-liability agents can qualify for the Chartered Property Casualty Underwriter (CPCU) designation by passing a series of examinations given by the American Institute for Property and Liability Underwriters. The RHU, CLU, and CPCU designations are recognized marks of achievement in their respective fields. A new designation, Accredited Advisors in Insurance, is also available. Agents and brokers can qualify for this by passing a series of three one-semester courses covering principles of insurance production, multiple-lines insurance production, and agency operation and marketing.

Agents and brokers should be enthusiastic, self-confident, and able to communicate effectively. They should be able to inspire customer confidence. Many employers give personality tests to prospective employees because personality attributes are important in sales work. Since agents usually work without supervision, they must be able to plan their time well and have initiative to locate new clients.

An insurance agent who shows sales ability and leadership may become a sales manager in a local office. A few agents advance to agency superintendent or company vice-president. However, many who have built up a good clientele prefer to remain in sales work. Some, particularly in the property-liability field, establish their own independent agencies or brokerage firms.

### Job Outlook

Employment of insurance agents and brokers is expected to grow about as fast as the average for all occupations through the 1980's as the volume of insurance sales continues to expand. Many additional jobs will open as agents and brokers transfer to other occupations, retire, or die. Due to the highly competitive nature of insurance selling, many beginners leave the field because they are unable to establish a sufficiently large clientele. Therefore, opportunities should be favorable for ambitious people who enjoy sales work.

Future demand for agents and brokers depends on the volume of insurance sales. The volume of life and health insurance should increase rapidly over the next decade as many more workers enter the 25-54 age

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Insurance agent calculates the cost of increasing a policyholder's coverage.

group. People in this group have the greatest need for life and health insurance, and protection for homes, automobiles, and other valuables. Life insurance sales also should grow as more families select policies designed to provide retirement income and educational funds for their children. Additional life insurance sales will also reflect the growing need for life insurance and disability protection for working women. Rising incomes as well as a concern for financial security also may stimulate sales of mutual funds, variable annuities, and other investments. Sales of property-liability insurance should rise as more people seek coverage not only for their homes and cars but also for expensive, advanced technology products such as home computers and video recorders, and as complex types of commercial coverage, such as product liability, workers' compensation, prepaid legal, kidnap, and pollution liability insurance are expanded.

Employment of agents and brokers may not keep pace with the rising level of insurance sales because more policies will be sold to groups and by mail. In addition, each agent should be able to handle more business as computers take over more routine clerical tasks. The trend toward multiline agents also will cause employment to rise more slowly than the volume of insurance sales.

Most individuals and businesses consider insurance a necessity, regardless of economic conditions. Therefore agents are not likely to face unemployment because of a recession.

## Earnings

Beginners in this occupation often are guaranteed a moderate salary while they learn the business and build a clientele. In many large companies, new agents received a median salary in 1981 of about $1,200 a month during this training period, which usually lasts about 6 months. Thereafter, most agents are paid on a commission basis. The size of the commission depends on the type and amount of insurance sold, and whether the transaction is a new policy or a renewal. Life insurance agents with 5 or more years of experience had a median income of $22,000 in 1981, but thousands of agents and brokers earned more than $40,000 a year, and many earned more than $100,000. Casualty insurance agents, usually earned higher incomes.

Agents and brokers generally pay their own automobile and travel expenses. Independent brokers must also pay office rent, clerical salaries, and other operating expenses out of their earnings.

Most agents have paid vacations, group life and health insurance plans, and retirement pensions. The size of most pensions depends on how much insurance an agent sells.

## Related Occupations

Other workers who sell complex or expensive products or services include real estate agents and brokers, securities sales workers, financial advisors, estate planning specialists, and manufacturers' sales workers.

## Sources of Additional Information

General occupational information about insurance agents and brokers is available from the home office of many life and property-liability insurance companies. Information on State licensing requirements may be obtained from the department of insurance at any State capital.

Information about a career as a life insurance agent also is available from:

American Council of Life Insurance, 1850 K St. NW., Washington, D.C., 20006.

The National Association of Life Underwriters, 1922 F St. NW., Washington, D.C. 20006.

For career information on property-liability agents, contact:

Insurance Information Institute, 110 William St., New York, N.Y. 10038.

Independent Insurance Agents of America, 100 Church St., New York, N.Y. 10007.

Alliance of American Insurers, 20 N. Wacker Dr., Chicago, Ill. 60606.

The National Association of Independent Insurers, Public Relations Department, 2600 River Rd., Des Plaines, Ill. 60018.

Professional Insurance Agents, 400 N. Washington St., Alexandria, Va. 22314.

# Manufacturers' Sales Workers

(D.O.T. 260 through 279.357)

## Nature of the Work

Practically all manufacturers employ sales workers. Manufacturers' sales workers sell mainly to other businesses—factories, banks, wholesalers, and retailers. They also sell to hospitals, schools, libraries, and other institutions.

Manufacturers' sales workers visit prospective buyers to inform them about the products they sell, analyze the buyers' needs, suggest how their products can meet these needs, and take orders. Sales workers visit firms in their territory, using an approach adapted to their line of merchandise. Those who handle crackers or cookies, for example, emphasize their wholesomeness, attractive packaging, and variety. Sometimes sales workers promote their products at trade shows and conferences.

Sales workers who deal in technical products, such as electronic equipment, often are called industrial sales workers. Some engineers, often called sales engineers, also sell technical products. (See statement on engineers elsewhere in the *Handbook*.) In addition to providing information on their firms' products, they help prospective buyers with technical problems. For example, they may recommend improved materials and machinery for a firm's manufacturing process, draw up plans of proposed machinery layout, and estimate cost savings from buying their equipment. They present this information to company officials and negotiate a sale, a process which may take many months. They may work with engineers in their own companies adapting products to a customer's special needs. Technical sales workers sometimes train customers' employees to operate and maintain new equipment, and make frequent visits to make certain that it is functioning properly.

Manufacturers' sales workers spend most of their time visiting prospective customers. They also prepare reports on sales prospects

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or customers' credit ratings, plan their work schedules, draw up lists of prospects, make appointments, handle correspondence, and study literature about their products.

## Working Conditions

Some manufacturers' sales workers have large territories and do considerable traveling. They may be away from home for several days or weeks at a time. Others usually work near their "home base." Manufacturers' sales workers call at the time most convenient to customers and may have to travel at night or on weekends. Frequently, they spend evenings writing reports. However, some plan their schedules for time off when they want it.

## Employment

Nearly 440,000 people were manufacturers' sales workers in 1980. Some worked out of their company's home office, often located at a manufacturing plant. The majority, however, worked out of branch offices, usually in big cities near prospective customers.

Large numbers of sales workers are employed by the printing and publishing, chemical, fabricated metal products, electrical, and other machinery industries, as well as the transportation and food products industries. In addition, there are many independent sales representatives who are self-employed and who work for a straight commission based on the dollar amount of their sales.

## Training, Other Qualifications, and Advancement

A college degree is increasingly desirable for a job as a manufacturers' salesworker. Manufacturers of nontechnical products usually seek graduates with degrees in liberal arts or business administration. Manufacturers of technical products usually seek graduates with degrees in science or engineering. Drug sales workers, also known as pharmaceutical detailers, usually need a background in biology and chemistry. Manufacturers of electrical equipment, heavy machinery, and some types of chemicals prefer to hire people who have studied engineering, physics, or chemistry. (Information on chemists, engineers, and others with the technical training suitable for work as manufacturers' sales workers is given elsewhere in the *Handbook*.)

Many companies, especially those that manufacture technical products, have formal training programs for beginning sales workers that last 2 years or longer. In some programs, trainees rotate among jobs in plants and offices to learn all phases of production, installation, and distribution of the product. In others, trainees take formal classroom instruction at the plant, followed by on-the-job training in a branch office under the supervision of a field sales manager.

A pleasant personality and appearance and the ability to get along well with people are important. Because sales workers may have to walk, stand for long periods, or carry product samples, some physical stamina is necessary. As in most selling jobs, arithmetic skills are an asset.

Sales representatives who have good sales records and leadership ability may advance to sales supervisors, branch managers, or district managers. Those with managerial ability eventually may advance to sales manager or other executive positions; many top executives in industry started as sales workers.

Frequent contact with business people in other firms helps sales workers transfer to other jobs. Some go into business for themselves as independent representatives. Others find opportunities in advertising and marketing research.

## Job Outlook

Employment in this field is expected to grow about as fast as the average for all occupations through the 1980's. Industrial firms, chainstores, and institutions that purchase large quantities of goods at one time frequently buy directly from the manufacturer. The need for sales workers should increase as manufacturers emphasize sales activities to compete for the growing number of these valuable accounts.

Many openings also will occur each year because of the need to replace workers who transfer to other occupations, retire, or die. As is the case in other sales jobs, turnover is fairly high. Each year, a number of new manufacturers' sales workers discover that they are not cut out for selling and leave the occupation.

Because sales are affected by changing economic conditions and consumer preferences, employment opportunities and earnings may fluctuate from year to year. Overall, opportunities are expected to be good for persons with appropriate product knowledge or technical expertise, plus the personal traits necessary for successful selling.

## Earnings

Earnings for manufacturers' sales workers may depend on the type of compensation plan. Some manufacturers pay experienced sales workers a straight commission, based on the dollar amount of their sales (as in the case of independent representatives); others pay a fixed salary. Most use a combination of salary and commission, salary and bonus, or salary, commission, and bonus. Bonus payments may depend on individual performance, on the performance of all sales workers in the group or district, or on the company's performance.

Salaries for inexperienced sales workers ranged between $13,900 and $15,400 a year in 1980, according to a survey conducted by the American Management Associations.

Manufacturers sales worker meets with prospective purchaser.

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The highest starting salaries generally were paid by industrial goods manufacturers. Experienced sales workers generally earned between $17,400 and $23,100 in 1980, depending upon the firm and the product. The highest paid sales workers generally earned between $26,200 and $33,500. Median total compensation (salary plus bonus or commission) for inexperienced sales workers ranged between $14,100 and $17,500 a year in 1980. Experienced sales workers received between $21,000 and $24,400, while sales supervisors earned between $32,400 and $37,400 during the same year. The highest total compensation was generally paid by industrial goods manufacturers.

### Related Occupations

Manufacturers' sales workers must have sales ability and a specific knowledge of the products they sell. Some related occupations that require these skills are buyers, route drivers, field-contact technicians, wholesale trade sales workers, real estate sales workers, insurance sales workers, and securities sales workers.

### Sources of Additional Information

For more information on the occupation of manufacturers' sales worker, write:

Manufacturers' Agents National Association, P.O. Box 16878, Irvine, Calif. 92713.

## Models

(D.O.T. 297.667-014; 961.367-010; and .667-010)

### Nature of the Work

Selling a product always is easier if an attractive person is shown using it. In magazine advertisements and television commercials, models can be seen posing with a wide variety of products, including cars, soft drinks, and perfume. Most models, however, are used to show the latest in fashion designs and cosmetics.

There are several different kinds of models. *Fashion models* generally work for clothing manufacturers, dress designers, department stores, or dress salons. They may model clothing in formal fashion shows or private showings or model informally—in store restaurants or on the sales floor, for example. In formal fashion shows, these models display clothing on a platform or runway. While the commentator describes what they are wearing, they stand, turn, and walk past customers and photographers and point out special features of the design. They may stop to tell individual customers a garment's price and style number during informal fashion shows where runways or platforms are not generally used.

Some fashion models specialize in showroom work. Known as *showroom* or *fitting models*, they are employed by clothing manufacturers to model clothes and accessories for the fashion buyers who visit manufacturers' showrooms on their regular buying trips. Many of these models work in New York's garment district. For showroom models, standard measurements are essential; perfect size may be more important than a beautiful face. When new spring or fall designs are being shown, these models are extremely busy. During slack times, however, they may have some general office duties, such as typing or filing.

*Photographic models* are hired by advertising agencies and freelance photographers, usually for a particular assignment. These models are seen on magazine covers and billboards in advertisements of all kinds; they generally are at the top of their profession. *Artists' models* pose for painters, sculptors, photographers, or art students. They must be able to hold a pose for a long period of time. Some models work in films and television doing commercials and demonstrating cosmetics, shampoos, deodorants, and other personal products. Models with acting experience may be preferred for this type of work.

Models may be hired to demonstrate new products and services at exhibits, trade shows, and sales meetings. They also are hired to appear at conventions, benefits, and political rallies. Models sometimes are sought for jobs as beauty consultants, fashion consultants, personal shoppers, or tour guides.

### Working Conditions

Modeling can be a glamorous and exciting career. Very successful models enjoy fame, travel, and the opportunity to meet famous personalities. However, the work is hard and not nearly as glamorous as many believe. Modeling is physically demanding; working hours are irregular and often very long; and getting work in the first place can be difficult. Building and maintaining a reputation as a model take determination and the expenditure of considerable time and attention on one's personal appearance.

Models sometimes must work under uncomfortable conditions, posing under hot studio lights, for example. The work can affect their personal lives because models must always look fresh and well rested for the camera and may have to limit their social activities. In addition, models may have to spend a good part of every day on beauty care.

Fashion models doing informal modeling work at a leisurely pace. They generally show to several customers a day. During slack periods, they may stroll through the store wearing apparel that store owners wish to bring to the attention of their clients. Fashion show models also experience slack periods when showrooms are free of buyers. Of course, they must be prepared to model and change outfits quickly when buyers appear. Those who deal with the public must be tactful, courteous, and feel comfortable around all kinds of people.

### Employment

An estimated 60,000 persons worked full time as models in 1980. In New York City's garment district, clothing manufacturers, designers, and wholesalers employ models full time to show their latest fashion designs to prospective retail buyers. The overwhelming majority of models, however, work on a freelance basis through agencies that arrange assignments for them. Many models only receive occasional assignments and need other jobs to support themselves. Advertising agencies, retail stores, maga-

Models must be able to hold a pose.

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zines, and photographers almost always employ agency models for their fashion articles or advertisements.

Modeling jobs are available in nearly all urban areas, but most jobs are in New York City because it is the center of the fashion industry. Other major cities offering opportunities include Chicago, Detroit, Los Angeles, Dallas, Miami, San Francisco, Boston, Washington, D.C., Atlanta, Philadelphia, and Houston.

## Training, Other Qualifications, and Advancement

The most important asset for a model is a distinctive and attractive physical appearance. Advertisers and clothing designers hire models who have the right "look" for their product and a face or style that is "eye catching."

Female fashion models usually must be between 5 feet 5 inches and 5 feet 10 inches tall. Male models generally must be between 6 feet and 6 feet 2 inches tall and wear a size 40 or 42 regular suit. Size requirements for specific assignments are quite rigid because manufacturers' and designers' samples are standard and clothes must fit the models without alteration. Broad shoulders, good coordination, and grace also are definite assets for fashion models.

Photographic models must have fine, regular features and good teeth, hands, and legs. Wide-set eyes and a long neck are also essential. Certain assignments, such as modeling shoes or jewelry, emphasize a model's legs or neck, for example. Above all, however, a model's photogenic qualities determine his or her success.

There are no educational requirements for models; some have completed high school and modeling school while others have had college training. Courses in drama, dancing, art, and fashion design are useful because they can help in developing poise and a sense of style. Any kind of formal training in developing modeling techniques can be helpful in this competitive job market.

Models should enjoy working with people and exhibit poise and self-confidence under the pressures of competition, tight schedules, and quick costume changes. Physical stamina is important because models are on their feet most of the time and must sometimes assume rather awkward positions when posing for photographers. To look their best under such pressure, models must maintain excellent health.

Aspiring models should understand the distinction between modeling schools and modeling agencies. Modeling schools teach students how to style their hair, walk and stand with good posture, pose in front of a camera, and apply makeup. Students also learn about skin care, diet and nutrition, exercise, speech, and etiquette. The main business of these schools is conducting classes; helping their graduates find work is not their central concern. Modeling schools vary in quality, and individuals considering enrolling in a modeling school should be sure that they select a reputable school, preferably one that is licensed by its State and has a good placement service.

Modeling agencies, on the other hand, are essentially employment agencies; they are in the business of finding and scheduling assignments for their models. They work on a commission basis, usually charging both the client and the model they represent. For every job the agency arranges, the model generally pays 10 to 20 percent of the modeling fee. Modeling agencies assist their models in various ways and may even provide training to help a model develop a distinctive style. However, agencies are selective about the models they accept and normally take on only the most promising beginners.

Once a model is listed with an agency, the agency makes an effort to find steady work for him or her. Agencies usually help their models assemble a portfolio of photographs of themselves in various poses and kinds of clothing. The agency and or the model then shows the portfolio to prospective clients. A portfolio is a necessary part of a model's career and requires constant updating as the model's career progresses.

Not all models get their jobs through modeling agencies. Some department stores hold auditions that give aspiring models a chance to model at store fashion shows. (Sales jobs in department stores can provide useful experience in selecting and coordinating fashions, using makeup, and, occasionally, informal modeling.) Fashion shows sponsored by local community organizations offer another opportunity for prospective models. As models gain experience and build a reputation, they move on to more prestigious and lucrative assignments.

Modeling also can be a stepping stone to other jobs in the fashion field, such as staff editor of a fashion magazine, consultant for a cosmetic firm, or fashion coordinator for a department store. Some models take courses in art and design and may become fashion illustrators or designers. Others become buyers or sales representatives. A few models who work in television commercials become actors or actresses.

## Job Outlook

Competition for available modeling jobs will continue to be keen through the 1980's. The glamour of modeling attracts many more persons than are needed in the occupation. Competition is particularly keen in New York City where models can earn the highest salaries working for national advertisers; other major cities, however, increasingly offer opportunities in this occupation. Experienced models will continue to receive most of the assignments.

Although rising advertising expenditures and sales of clothing and accessories should cause the demand for both photographic and fashion models to increase, most job openings each year will result from the need to replace models who leave the occupation. Many models have to retire when they lose their youthful appearance. Others leave the occupation because their particular "look" goes out of style or becomes associated with an outdated product. Male models generally have a longer working life than female models.

## Earnings

A model's earnings depend on the number, length, and type of assignments he or she receives. Female models generally command higher salaries than male models. Although a few top models earn as much as or more than top business executives, most earn far less. According to the limited information available, fashion models working full time for manufacturers or wholesalers generally earned around $22,000 a year in 1980.

Models who work for more than one employer receive a fee for their work. If they are registered with an agency, they pay a commission for the services it provides. Models working for major agencies in New York City on a steady basis earned from about $20,000 to $55,000 a year; most earned around $35,000. Models in other cities earned lower rates. Part-time photographic models generally earned from $50 to $100 an hour; models working in retail stores or conventions earned from $8 to $12 an hour. Models in other major cities earned lower rates. These rates are misleading, however, because many models, especially beginners, work only a few hours each week and spend a great deal of their time auditioning for prospective clients. Models' incomes also depend on the type of work they do, whether runway or photographic work. The more versatile the model, the greater the number of assignments and the greater the income he or she may receive. Although photographic modeling often pays well, models usually must provide their own accessories, such as wigs and hairpieces, and pay for their transportation. Occasionally, a model must buy a complete outfit in order to get a particular job.

Models working as extras in television commercials earned about $180 a day in 1980; principal characters earned around $275 a day and sometimes received additional income when the commercial was rerun. Models in industrial or educational films earned about $225 a day. Television models must be members of the American Federation of Television and Radio Artists and/or the Screen Actors Guild, Inc.

## Related Occupations

A pleasing physical appearance, grace, and the ability to relate to other people are the essential ingredients in a model's success. Others for whom these qualities are important include demonstrators, guides, stand-ins or doubles for star performers, character impersonators, and entertainers.

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## Sources of Additional Information

Information on careers and training for models is available from:

World Modeling Association, P.O. Box 100, Croton-on-Hudson, New York, N.Y. 10520.

Employers of models, such as retail stores, advertising agencies, magazines, and newspapers, also may be able to recommend reputable modeling agencies and schools.

# Real Estate Agents and Brokers

(D.O.T. 186.117-058; 250.157-010, .357-014 and -018)

## Nature of the Work

Shelter, whether a house or an apartment, is the single most expensive item in most people's budgets. Thus, people generally seek the help of a real estate agent or broker when buying or selling a home. These workers have a thorough knowledge of the housing market in their community. They know which neighborhoods will best fit their clients' lifestyles and budgets, local zoning and tax laws, and where to obtain financing for the purchase. Agents and brokers also act as a medium for price negotiations between buyer and seller.

Brokers are independent business people who not only sell real estate owned by others, but also rent and manage properties, make appraisals, and develop new building projects. In closing sales, brokers often arrange for loans to finance the purchases, for title searches, and for meetings between buyers and sellers when details of the transactions are agreed upon and the new owners take possession. A broker's resourcefulness and creativity in arranging financing often mean the difference between success and failure in closing a sale. In some cases, agents assume the responsibilities in closing sales. Brokers also manage their own offices, advertise properties, and handle other business matters. Some combine other types of work, such as the sale of insurance or the practice of law, with their real estate business.

Real estate agents generally are independent sales workers who contract their services with a licensed broker. Today, relatively few agents work as employees of a broker or realty firm.

In selling or renting real estate, agents generally first meet with potential buyers to get a feeling for the type of home they would like and can afford. Then, they may take the client to see a number of homes that appear to meet the needs and income of the client. Because real estate is so expensive, agents may have to meet several times with a prospective buyer to discuss properties. In answering questions, agents emphasize those selling points that are likely to be most important to the buyer. To a young family looking at a house, for example, they may point out the convenient floor plan and the fact that schools and shopping centers are close by. Whenever bargaining over price becomes necessary, agents carefully follow the seller's instructions and may present counteroffers in order to get the best possible price.

About half a million people work as real estate agents.

There is more to agents' jobs, however, than just selling. Since they must have properties to sell, agents spend a significant amount of time obtaining "listings" (owner agreements to place properties for sale with the firm). Much time is spent on the telephone exploring leads gathered from advertisements and personal contacts. When listing property for sale, agents make comparisons with similar property being sold to determine its fair market value.

Most real estate agents and brokers sell residential property. A few, usually in large firms, specialize in commercial, industrial, or other types of real estate. Each specialty requires knowledge of that particular type of property and clientele. Selling or leasing business property, for example, requires an understanding of leasing practices, business trends, and location needs. Agents who sell or lease industrial properties must know about transportation, utilities, and labor supply. To sell residential properties, the agent must know the location of schools, religious institutions, shopping facilities, and public transportation, and be familiar with tax rates and insurance coverage.

## Working Conditions

Although real estate agents and brokers generally base their operations in offices, most of their time is spent outside the office—showing properties to clients, evaluating

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properties for sale, meeting with prospective clients, and performing a wide range of other duties. Brokers provide office space, but agents generally furnish their own automobiles.

Agents and brokers often work long hours—more than 50 a week. In addition, they often work evenings and weekends to suit the convenience of their clients.

## Employment

According to a Bureau of the Census survey, an estimated 580,000 persons sold real estate as their primary occupation in 1980; many others sold on a part-time basis while working in other occupations.

Most real estate firms are relatively small; indeed, some brokers operate a one-person business. Some large firms have several hundred real estate agents operating out of many branch offices. A growing number of brokers, currently about 30 percent, have entered into franchise agreements with national or regional real estate organizations. Under this type of arrangement, similar to many fast-food restaurant operations, the broker pays a fee in exchange for the privilege of using the more widely known name of the parent organization. Although franchised brokers often receive help in training salespeople and in running their offices, they bear the ultimate responsibility for the success or failure of the firm.

Real estate is sold in all areas, but employment is concentrated in large urban areas and in smaller but rapidly growing communities.

## Training, Other Qualifications, and Advancement

Real estate agents and brokers must be licensed in every State and in the District of Columbia. All States require prospective agents to be a high school graduate, be at least 18 years old, and pass a written test. The examination—more comprehensive for brokers than for agents—includes questions on basic real estate transactions and on laws affecting the sale of property. Most States require candidates for the general sales license to complete at least 30 hours of classroom instruction and those seeking the broker's license to complete 90 hours of formal training in addition to a specified amount of experience in selling real estate (generally 1 to 3 years). Some States waive the experience requirements for the broker's license for applicants who have a bachelor's degree in real estate. State licenses generally must be renewed every year or two, usually without reexamination. Some States, however, require continuing education for license renewal.

As real estate transactions have become more complex, many of the large firms have turned to college graduates to fill sales positions. A large number of agents have some college training, and the number of college graduates selling real estate has risen substantially in recent years. However, personality traits are fully as important as academic background. Brokers look for applicants who possess such characteristics as a pleasant personality, honesty, and a neat appearance. Maturity, tact, and enthusiasm for the job are required in order to motivate prospective customers in this keenly competitive field. Agents also should have a good memory for names and faces and business details, such as taxes, zoning regulations, and local land-use laws.

Persons interested in beginning jobs as real estate agents often apply in their own communities, where their knowledge of local neighborhoods is an advantage. The beginner usually learns the practical aspects of the job under the direction of an experienced agent.

Many firms offer formal training programs for both beginners and experienced agents. Larger firms generally offer more extensive programs than smaller firms. Over 800 universities, colleges, and junior colleges offer courses in real estate. At some, a student can earn an associate or bachelor's degree with a major in real estate; several offer advanced degrees. Many local real estate boards that are members of the National Association of Realtors sponsor courses covering the fundamentals and legal aspects of the field. Advanced courses in appraisal, mortgage financing, property development and management, and other subjects also are available through various National Association affiliates.

Trained and experienced agents can advance in many large firms to sales or general manager. Persons who have received their broker's license may open their own offices. Training and experience in estimating property value can lead to work as a real estate appraiser, and people familiar with operating and maintaining rental properties may specialize in property management. Those who gain general experience in real estate, and a thorough knowledge of business conditions and property values in their localities, may enter mortgage financing or real estate investment counseling.

## Job Outlook

Employment of real estate agents and brokers is expected to rise faster than the average for all occupations through the 1980's in order to satisfy a growing demand for housing and other properties. In addition, many openings will occur each year as workers die, retire, or leave for other reasons. Replacement needs are high because a relatively large number of people transfer to other work after a short time selling real estate.

Employment growth in this field will stem primarily from increased demand for home purchases and rental units. Shifts in the age distribution of the population over the next decade will result in a larger number of young adults with careers and family responsibilities. This is the most geographically mobile group in our society and the one that traditionally makes the bulk of home purchases. As their incomes rise, these people also may be expected to purchase larger homes and vacation properties. During periods of declining economic activity and tight credit, the volume of sales and the resulting demand for sales workers may decline. During these periods, the number of persons seeking sales positions may outnumber openings.

Competition among agents and brokers is keen and prospects for a career in real estate will be best for well-trained, ambitious people who enjoy selling. The proportion of part-time real estate agents has declined in recent years as brokers have demanded greater skill and professionalism from those selling real estate. This decline is expected to continue as agents need more specialized knowledge to handle real estate transactions.

## Earnings

Commissions on sales are the main source of earnings—very few real estate agents work for a salary. The rate of commission varies according to the type of property and its value; the percentage paid on the sale of farm and commercial properties or unimproved land usually is higher than that paid for selling a home.

Commissions may be divided among several agents and brokers. The broker and agent in the firm that obtained the listing generally share their part of the commission when the property is sold; the broker and agent in the firm that made the sale also generally share their part of the commission. Although an agent's share varies greatly from one firm to another, often it is about half of the total amount received by the firm.

The median salary of full-time real estate agents was $14,700 a year in 1980, according to a survey conducted by the National Association of Realtors; agents working fewer than 30 hours a week averaged about $4,400. According to the same survey, real estate brokers earned a median salary of nearly $29,000 a year in 1980. The most successful agents and brokers earn considerably more. Some firms, especially the large ones, furnish group life, health, and accident insurance.

Income usually increases as an agent gains experience, but individual ability, economic conditions, and the type and location of the property also affect earnings. Sales workers who are active in community organizations and local real estate boards can broaden their contacts and increase their earnings. A beginner's earnings often are irregular because a few weeks or even months may go by without a sale. Although some brokers allow an agent a drawing account against future earnings, this practice is not usual with new employees. The beginner, therefore, should have enough money to live on until commissions increase.

## Related Occupations

Selling expensive items, such as homes, requires certain personal characteristics including maturity, tact, and a sense of responsibility. Other sales workers who find these

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character traits important in their work include automobile sales workers, securities sales workers, insurance agents and brokers, yacht brokers, travel agents, and manufacturers' representatives.

### Sources of Additional Information

Details on licensing requirements for real estate agents and brokers are available from most local real estate organizations or from the State real estate commission or board.

For more information about opportunities in real estate work, as well as a list of colleges and universities offering courses in this field, contact:

National Association of Realtors, 430 N. Michigan Ave., Chicago, Ill. 60611.

## Retail Trade Sales Workers

(D.O.T. 260 through 290.477)

### Nature of the Work

The success of any retail business depends largely on its sales workers. Courteous and efficient service from behind the counter or on the sales floor does much to satisfy customers and build a store's reputation.

Whether selling furniture, electrical appliances, or clothing, a sales worker's primary job is to interest customers in merchandise—by describing its construction, demonstrating its use, and showing various models and colors. For some jobs, special knowledge or skills are needed. In a pet shop, for example, sales workers must know about the care and feeding of animals. However, in jobs selling standardized articles such as food, hardware, linens and housewares, sales workers often do little more than take payments and wrap purchases. (Cashiers also wrap or bag purchases, receive payments, and make change. See the statement on cashiers elsewhere in the *Handbook*.)

In addition to selling, most retail sales workers make out sales checks, receive cash payments, and give change and receipts. They also handle returns and exchanges of merchandise and keep their work areas neat. In small stores, they may help order merchandise, stock shelves or racks, mark price tags, take inventory, and prepare displays.

### Working Conditions

Most sales workers in retail trade work in clean, comfortable, well-lighted stores. Some, however, work outside the store. Kitchen equipment sales workers may visit prospective customers' homes, for example, to help them plan renovations, and used-car sales workers may spend much time at an outdoor lot. Many sales workers must stand for long periods.

Many sales workers have a 5-day, 40-hour week, although in some stores the standard workweek is longer. Because Saturday is a busy day in retailing, employees usually work that day and have a weekday off. Longer than normal hours may be scheduled before Christmas and during other peak periods. Some, especially those employed by stores in suburban shopping centers, regularly work one evening or more a week.

Sales workers should be able to explain a product's special features.

Part-time sales workers generally work during peak hours of business—daytime rush hours, evenings, and weekends.

### Employment

In 1980, more than 3.3 million sales workers were employed in retail businesses. They worked in stores ranging from the small drug or grocery store employing one part-time sales person to the giant department store with hundreds of sales workers. They also worked for door-to-door sales companies and mail-order houses. The largest employers of retail trade sales workers are department stores and other general merchandise stores, apparel and accessories, food, drug, and furniture stores, and car dealers. (For a discussion of sales workers in motor vehicle dealerships, see statements on automobile parts counter workers, automobile sales workers, and automobile service advisors elsewhere in the *Handbook*.)

Retail sales jobs are distributed geographically much the same way as the population; most sales workers are employed in cities and their nearby suburbs.

### Training, Other Qualifications, and Advancement

Employers generally prefer high school graduates for sales jobs, but also hire those with less education. Persons under 18 may need a work permit.

Thousands of high schools across the country have distributive education programs, generally with a cooperative arrangement between the school and businesses. Students work part time at local stores while taking courses in merchandising, accounting, and other aspects of retailing. The experience and education gained can improve their prospects for permanent employment.

Many distributive education programs include adult and continuing education. In addition, a federally funded project called "70,001" focuses on the needs of disadvantaged youth and high school dropouts. Involving schools and colleges across the Nation, "70,001" combines full-time employment with part-time instruction after hours.

Many high schools and colleges have a chapter of Distributive Education Clubs of America (DECA), a service organization dedicated to the goals of teaching distributive education and good citizenship. DECA members—students and faculty—run their local

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chapter, elect officers, and plan and participate in activities on the local, State, and national levels.

Persons interested in sales jobs should apply to the personnel offices of large retail stores, where they are likely to be interviewed and, in some cases, given an aptitude test. Employers prefer those who enjoy working with people and have the tact to deal with difficult customers. Among other desirable characteristics are an interest in sales work, a pleasant personality, a neat appearance, and the ability to communicate clearly.

In most small stores, an experienced employee or the proprietor instructs newly hired sales personnel in making out sales checks and operating the cash register. In many larger stores, training programs are more formal and include specialized training in selling certain products.

Inexperienced sales workers in department stores typically begin in housewares, notions, and other departments where a customer needs little assistance. As they gain experience and seniority, they move to positions of greater responsibility. The most experienced—and the highest paid—sales workers sell "big ticket" items such as large appliances, furniture, and rugs. This work requires the most knowledge of the product and the greatest talent for persuasion.

Traditionally, capable sales workers without a college degree could advance to management positions. However, a college education is now becoming increasingly important for advancement. Large retail businesses generally prefer to hire college graduates as management trainees. Despite this trend, capable employees with less than a college degree should still be able to advance to administrative or supervisory work in large stores.

Opportunities for advancement are limited in small stores where one person, often the owner, does most managerial work. Retail selling experience may be an asset in qualifying for sales work with wholesalers or manufacturers.

## Job Outlook

Employment of retail trade sales workers is expected to grow about as fast as the average for all occupations through the 1980's as the retail trade industry expands in response to a growing population and higher personal incomes. The volume of sales will outpace employment increases, however, as self-service—already the rule in most food-stores—is extended to variety and other kinds of stores.

Retail trade will continue to be a good source of job opportunities for high school graduates. Prospects for sales jobs are good because retail selling is a large occupation and turnover is high. Most openings will occur as experienced sales workers leave their jobs. In addition to full-time jobs, there will be many opportunities for part-time workers, as well as for temporary workers during peak selling periods such as the Christmas season.

During recessions the volume of sales and the resulting demand for sales workers may decline. Purchases of durable goods and "big ticket" items, such as cars and appliances, are most likely to be postponed during difficult economic times. In areas of high unemployment, sales of all types of goods may decline. Layoffs, however, are unlikely. Since sales worker turnover is usually very high, employers often can cut employment by simply not replacing all those who leave.

## Earnings

In 1980, the starting wage for most retail sales positions (including part time and temporary) not covered by union contracts was the Federal minimum wage, $3.35 an hour. Some stores doing less than $325,000 in business per year paid less, since they are not required to pay the minimum wage. In 1980, median earnings, including bonuses and commissions, generally ranged from $8,312 to $14,203 a year for full-time sales workers. Earnings are likely to be higher than the median in jobs that require special sales ability or technical knowledge of merchandise, for example, in automobile, major appliance, and furniture sales.

Some sales workers receive salary plus commissions—that is, a percentage of the sales they make. Others are paid only commissions. Those paid by commission may find their earnings greatly affected by ups and downs in the economy.

Sales workers in many retail stores may buy merchandise at a discount, often from 10 to 25 percent below regular prices. This privilege sometimes is extended to the employee's family. Some stores, especially the large ones, pay part or all of the cost of life insurance, health insurance, and a pension.

## Related Occupations

Sales workers apply a general knowledge of sales techniques and specific knowledge of the products they sell. These skills are used by people in a number of other occupations, including demonstrators, route drivers, real estate sales agents, telephone solicitors, buyers, insurance agents and brokers, and manufacturers' representatives.

## Sources of Additional Information

Information on careers in retailing may be obtained from the personnel offices of local stores; from State merchants' associations; or from local unions of the United Food and Commercial Workers International Union.

Information on distributive education programs may be obtained from your State employment service or by writing to:

U.S. Department of Education, Division of Vocational/Technical Education, Washington, D.C. 20202.

For information about a "70,001" program in your area, write:

"70,001" Limited, 600 Maryland Ave. SW., Washington, D.C. 20024.

# Securities Sales Workers

(D.O.T. 251.157-010)

## Nature of the Work

When investors want to buy or sell stocks, bonds, shares in mutual funds, or other financial products, they call on securities sales workers to put the "market machinery" into operation. Both individuals with a few hundred dollars and large institutions with millions to invest need such services. These workers often are called *registered representatives, account executives*, or *brokers*.

When an investor wishes to buy or sell securities, sales workers may relay the order through their firms' offices to the floor of a securities exchange, such as the New York Stock Exchange on Wall Street. If a security is not traded on an exchange, the sales worker sends the order to the firm's trading department which trades it directly with a dealer in the over-the-counter market. After the transaction has been completed, the sales worker notifies the customer of the final price.

Securities sales workers also provide many related services for their customers. Depending on a customer's knowledge of the market, they may explain the meaning of stock market terms and trading practices; offer financial counseling; devise an individual financial portfolio for the client including securities, life insurance, tax shelters, annuities, and other investments; and offer advice on the purchase or sale of a particular security.

Not all customers have the same investment goals. Some individuals may prefer long-term investments designed either for capital growth or to provide income over the years; others might want to invest in short-term securities that they hope will rise in price quickly. Securities sales workers furnish information about the advantages and disadvantages of an investment based on each person's objectives. They also supply the latest price quotations on any security in which the investor is interested, as well as information on the activities and financial positions of the corporations these securities represent.

Securities sales workers may serve all types of customers or they may specialize in one type only, such as institutional investors. They also may specialize in certain kinds of securities, such as mutual funds. Some handle the sale of new issues, such as corporation securities issued to finance plant expansion.

Beginning securities sales workers spend much of their time searching for customers. They may meet some clients through business and social contacts. But many sales workers find it useful to get additional exposure by teaching adult education investment courses or giving lectures at libraries or so-

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cial clubs. Telephone solicitation also is common. Once they have established a clientele, securities sales workers put more effort into servicing existing accounts and less into seeking new ones.

## Working Conditions

Securities sales workers usually work in offices where there is much activity. In large offices, for example, rows of sales workers sit at desks in front of "quote boards" that continually flash information on the prices of securities. When sales activity increases, due perhaps to unanticipated changes in the economy, the pace may become very hectic.

Established sales workers usually work the same hours as others in the business community. Beginners who are seeking customers may work much longer, however. Some sales workers accommodate customers by meeting with them in the evenings or on weekends.

## Employment

About 63,000 persons were employed as securities sales workers in 1980. In addition, a substantial number of people in other occupations also sold securities. These include partners and branch office managers in securities firms as well as insurance agents and brokers offering securities to their customers.

Securities sales workers are employed by brokerage firms, investment bankers, and mutual funds in all parts of the country. Many of these firms are very small. Most sales workers, however, work for a small number of large firms with main offices in big cities (especially in New York) and approximately 7,200 branch offices in other areas.

## Training, Other Qualifications, and Advancement

Because a securities sales worker must be well informed about economic conditions and trends, a college education is increasingly important, especially in the larger securities firms. Although employers seldom require specialized academic training, courses in business administration, economics, and finance are helpful.

Many employers consider personality traits as important as academic training. Employers seek applicants who are well groomed, able to motivate people, and ambitious. Because maturity and the ability to work independently also are important, a growing number of employers prefer to hire those who have achieved success in other jobs. Successful sales or managerial experience is very helpful to an applicant.

Securities sales workers must meet State licensing requirements, which generally include passing an examination and, in some cases, furnishing a personal bond. In addition, sales workers must register as representatives of their firm according to regulations of the securities exchanges where they do business or the National Association of Securities Dealers, Inc. (NASD). Before beginners can qualify as registered representatives, they must pass the Securities Exchange Commission's General Securities Examination, or examinations prepared by the exchanges or the NASD. These tests measure the prospective representative's knowledge of the securities business, customer practices, and recordkeeping procedures. Character investigations also are required.

Securities sales workers spend much of their time talking with clients.

Most employers provide on-the-job training to help sales workers meet the requirements for registration. In member firms of all major exchanges, the training period is at least 4 months. Trainees in large firms may receive classroom instruction in security analysis and effective speaking, take courses offered by business schools and other institutions and associations, and undergo a period of on-the-job training lasting up to two years. In small firms, sales workers generally receive training in outside institutions.

Sales workers take training, through their firms or outside institutions, to keep abreast of new financial products as they are introduced on the market. Training in the use of computers is becoming very important as the securities sales business becomes increasingly automated.

The principal form of advancement for securities sales workers is an increase in the number and the size of the accounts they handle. Although beginners usually service the accounts of individual investors, eventually they may handle very large accounts such as those of banks and pension funds. Some experienced sales workers become branch office managers and supervise other sales workers while continuing to provide services for their own customers. A few representatives may become partners in their firms or do administrative work.

## Job Outlook

The number of securities sales workers is expected to grow faster than the average for all occupations through the 1980's. In addition to jobs resulting from growth, many sales workers will be needed annually to replace those who transfer to other jobs, retire, or die. Due to the highly competitive nature of securities sales work, many beginners leave the field because they are unable to establish a sufficient clientele.

Employment of securities sales workers is expected to expand as economic growth and rising personal incomes increase the funds available for investment. Growth in the number and size of institutional investors will be particularly strong as more people purchase stocks, bonds, shares in mutual funds, annuities, and contribute to the endowment funds of colleges and other nonprofit institutions. In addition, more workers will be needed to sell securities issued by new and expanding corporations and by State and local governments financing public improvements. Mature individuals with successful work experience should find many job opportunities.

The demand for securities sales workers fluctuates as the economy expands and contracts. Thus, in an economic downturn the number of persons seeking jobs usually exceeds the number of openings—sometimes by a great deal. Over the long run, however, job opportunities for securities sales workers are expected to be more favorable. During severe slumps in market activity, job prospects and income stability will be greater for sales workers who are qualified to provide their clients with complete financial services than for those who rely strictly on commissions from stock transactions.

## Earnings

According to the Securities Industry Association, earnings of full-time, experienced se-

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curities sales workers who service individual investors averaged over $40,000 a year in 1980. Those who service institutional accounts averaged over $88,000.

Trainees usually are paid a salary until they meet licensing and registration requirements. After registration, a few firms continue to pay a salary until the new representative's commissions increase to a stated amount. The salaries paid during training usually range from $900 to $1,200 a month.

After candidates are licensed and registered, their earnings depend on commissions from the sale or purchase of stocks and bonds, life insurance, or other securities for customers. Commission earnings are likely to be high when there is much buying and selling and lower when there is a slump in market activity. Most firms provide sales workers with a steady income by paying a "draw against commission"—that is, a minimum salary based on the commissions which they can be expected to earn. A few firms pay sales workers only salary and bonuses that usually are determined by the volume of company business.

## Related Occupations

Similar sales jobs requiring specialized knowledge include insurance agents and real estate agents. Other occupations in the securities business are broker floor representatives and commodities brokers.

## Sources of Additional Information

Further information concerning a career as a securities sales worker is available from:

Securities Industry Association, 20 Broad St., New York, N.Y. 10005. (There is a $1 charge for this material.)

Career information also may be obtained from the personnel departments of individual securities firms.

# Travel Agents

(D.O.T. 252.157-010)

## Nature of the Work

Planning your own trip can be frustrating and time consuming. Many travelers, therefore, seek the assistance of travel agents—specialists who have the information and know-how to make the best possible travel arrangements, with their clients' tastes, budgets, and other requirements in mind.

Consider, for example, the contrast between arrangements for an executive with a tight schedule and a family of four on a restricted budget, both planning a visit to Washington, D.C. The executive might want to fly first class, stay in a hotel suite he or she could use for business meetings, and have a limousine ready upon arrival to make business calls. The agent would make the necessary arrangements, and perhaps send the bill to the executive's company. For the family, on the other hand, the travel agent would recommend less expensive, off-season, all-inclusive packages and special air fares. The agent would describe a wide range of hotel facilities and arrange the most economical but pleasurable trip. The agent also would arrange for a car rental or escorted bus tours, suggest local tourist attractions and restaurants, and acquaint the family with the city's climate.

For international travel, the agent would also provide information on customs regulations, required papers (passports, visas, and certificates of vaccination), and the most recent currency exchange rates.

When making travel arrangements, travel agents consult a variety of sources for information on departure and arrival times, fares, and hotel ratings and accommodations. They often use their own travel experiences as a basis for making recommendations. Some travel agents, especially in large agencies, may devote most of their time to visiting different hotels, resorts, and restaurants to rate their comfort, cleanliness, and quality of food and service.

Travel agents also do considerable promotional work. They may give slide or movie presentations to social and special interest groups, arrange advertising displays, and meet with business managers to suggest company-sponsored trips.

## Working Conditions

Travel agents usually travel at substantially reduced rates. Sometimes hotels or resorts offer travel agents free holidays.

Most travel agents do not, however, spend much time traveling. Most of their time is spent behind a desk conferring with clients, completing paperwork, contacting airlines and hotels for travel arrangements, and promoting group tours. Many agents, especially those who are self-employed, frequently work long hours.

## Employment

In 1980, about 52,000 persons worked as travel agents. A very small portion of these people worked as travel accommodation appraisers who evaluated various hotels and restaurants.

Though travel agents work in every part of the country, they are concentrated in major population centers where the best business opportunities exist. About one-half of all travel agencies are in large cities; one-third, in suburban areas; and one-fifth, in small towns and rural areas.

Roughly one-fourth of all travel agents are self-employed. Generally, these persons gained experience and recognition in an established travel agency before going into business for themselves.

Travel agents rely on computers for up-to-the-minute information on fares and accommodations.

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## Training, Other Qualifications, and Advancement

Students can prepare for careers as travel agents by working part time or during summers as reservation clerks or receptionists in travel agencies. As they gain experience, they may enter either a formal or informal training program given by the agency, take on greater responsibilities, and eventually assume the full workload of a travel agent. Experience as an airline reservation agent also is a good background for a travel agent.

Several home-study courses provide a basic understanding of the travel industry. Travel courses are offered in vocational schools, adult education programs in public high schools, community colleges, and 4-year colleges. A few colleges offer a bachelor's degree in travel, service/marketing, and in tourism. Experienced travel agents can take an advanced course, leading to the designation of Certified Travel Counselor, offered by the Institute of Certified Travel Agents. Another recognized mark of achievement in this field is a certificate of proficiency from the American Society of Travel Agents. It is awarded to those who pass five tests covering the duties of travel agents.

Although few college courses relate directly to the travel industry, a college education is sometimes preferred by employers. Courses in geography, foreign languages, history, and computer science are most useful. Courses in accounting and business management also are important, especially for those who expect to start their own travel agencies.

Broad experience as a national or international traveler is an asset, since the ability to speak with some personal knowledge about a city or foreign country often helps to influence clients' travel plans.

As a sales representative, the travel agent must be pleasant and patient. Agents often must demonstrate their efficiency and sense of responsibility to hard-to-please clients.

Travel agents who start their own agencies must gain formal conference approval before they can receive commissions. Conferences are organizations of airlines, shiplines, or rail lines; the International Air Transport Association, for example, is the conference of international airlines. To gain conference approval, an agency must be in operation, be financially sound, and employ at least one experienced travel agent.

Since conference approval can take a year or more to obtain, most self-employed agents make very little profit in their first year. Their income generally is limited to commissions from hotels and tour operators and to nominal fees for making complicated arrangements. For those considering starting their own agency, working capital between $30,000 and $50,000 will be needed to carry the agency through a profitless first year.

There are no Federal licensing requirements for travel agents. However, Rhode Island, Ohio, and Hawaii now have licensing requirements. In California, travel agents not approved by a conference are required to have a license.

## Job Outlook

Employment of travel agents is expected to grow much faster than the average for all occupations through the 1980's. Some job openings will occur as new agencies open and existing agencies expand, but most will occur as experienced agents die, retire, or leave the occupation. However, since the industry generally is sensitive to the fluctuations of the economy, opportunities at any given time depend heavily upon whether or not people can afford to travel. Long-distance travel plans are likely to be deferred during economic downturns. For example, travel spending decreased significantly during the 1973-75 recession.

Despite economic fluctuations, spending on travel is expected to increase significantly through the 1980's. As business activity expands, so will business-related travel. Also, with rising incomes and increasing emphasis on leisure-time activities, more people are expected to travel—and do so more frequently—than in the past.

The use of charter flights and larger, more efficient planes, especially for trips to other countries, have brought air transportation within the budget of many Americans. The recent easing of government regulation of air fares and routes should also help increase traveling by fostering greater competition among airlines to offer better and more affordable service. More travel agents will be needed to handle this extra business.

In addition, more and more foreign visitors come to the United States each year, and American travel agents and travel wholesalers often organize tours for these visitors.

## Earnings

Earnings of travel agents who own their agencies depend mainly on commissions from airlines and other carriers, tour operators, and lodging places. Commissions for domestic travel arrangements are about 9 percent; for cruises, about 10 percent; for hotels, sightseeing tours, and car rentals, 10 percent; and for international travel, about 8 percent. When travel agents arrange individual plans that require several connections on different transportation modes, they generally charge the customer a service fee for the time and expense involved. For most services, however, commissions constitute the agent's only compensation.

During the first year or two, while awaiting conference approval, self-employed travel agents generally have very low earnings. Even established agents experience less profitable years during periods of economic downturn.

Experience, sales ability, and the size and location of the agency determine the salary of a travel agent. Salaries of travel agents generally ranged from $9,500 to $18,000 a year in 1980. Salaried agents usually have standard benefits—pension plans, insurance coverage, paid vacations—that self-employed agents must provide for themselves.

## Related Occupations

Travel agents organize and schedule business, education or leisure travel or activities. Other workers with similar responsibilities include secretaries, tour guides, airline reservation agents, rental car agents, and travel counselors.

## Sources of Additional Information

For further information on training opportunities, contact:

American Society of Travel Agents, 711 5th Avenue, New York, N.Y. 10022.

# Wholesale Trade Sales Workers

(D.O.T. 260 through 279.357)

## Nature of the Work

Sales workers in wholesale trade help move goods from the factory to the consumer. They represent wholesalers that distribute to stores selling directly to the consumer. A wholesale drug sales worker, for example, may sell many brands of drugs, soap, and cosmetics to local pharmacies. Likewise, a wholesale construction materials distributor sells lumber, bricks, glass, and other construction materials to builders who would otherwise have to deal with many manufacturers.

Wholesale trade sales workers visit buyers for retail, industrial, and commercial firms, and institutions such as schools and hospitals. They show samples, pictures, or catalogs that list items their company stocks. They may also show customers how their products can save money and improve productivity. For example, when selling electrical machinery, they may demonstrate how the new equipment will cut the firm's costs. Sales workers seldom urge customers to purchase any particular product, since they handle a large number of items. Instead, they offer prompt, dependable service so buyers will become regular customers.

Wholesale sales workers perform many services for retailers, such as checking the store's stock and ordering items that will be needed before the next visit. Some wholesale sales workers help retailers improve and update ordering and inventory systems and advise them about advertising, pricing, and window and counter displays. Sales workers who handle machinery may give technical assistance on installation and maintenance.

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Sales workers keep records of sales, forward orders to their wholesale houses, prepare reports and expense accounts, plan work schedules, draw up lists of prospects, make appointments, and study literature describing their products. Some collect money for their companies.

## Working Conditions

Sales workers often have long, irregular work hours. Although they call on customers during business hours, they may travel at night or on weekends to meet their schedules. However, most sales workers seldom are away from home for more than a few days at a time. They may spend evenings writing reports and orders, carry heavy catalogs and sample cases, and be on their feet for long periods.

## Employment

About 1.1 million persons were employed as wholesale sales workers in 1980. Most operated out of home offices in wholesale houses which usually are located in large cities. Sales workers may cover a territory in a small section of a city with many retail stores and industrial users or, in less populated regions, they may cover half a State or more.

Firms selling machinery to industrial and business users are the largest employers of wholesale sales workers. Other large employers are companies that sell food products, motor vehicles and parts, hardware and plumbing, and electrical goods.

Wholesale trade sales worker discusses floor covering with a customer.

## Training, Other Qualifications, and Advancement

The background needed for sales jobs varies by product line and market. Complex products require technical backgrounds. Drug wholesalers, for example, seek people with a college degree in chemistry, biology, or pharmacy as trainees. Wholesalers provide training on characteristics of their products and how to sell them. For non-technical products such as food, sales ability and familiarity with manufacturers and brands is more important than knowledge about the product itself.

Most wholesale sales workers get their jobs by working up the ladder or by transferring in with the appropriate background. Some employers hire high school graduates for nonselling jobs or as sales trainees. These beginners usually work in several kinds of nonselling jobs before being assigned to sales. They may start in the stockroom or shipping department to become familiar with the thousands of items the wholesaler carries or in the bookkeeping department to learn about prices and recordkeeping. They are likely to work on "inside" sales, writing telephone orders, before they actually observe and work with experienced sales workers on calls to customers. Usually it takes 2 years or longer to prepare trainees for outside selling.

Sales trainees in very large wholesale firms participate in formal training programs that combine classroom instruction with short rotations in nonselling jobs. In most firms, however, trainees learn informally by observing experienced workers and trying the different aspects of the work. As they become familiar with customers and procedures, they gradually take on the full responsibility of the job.

Experienced sales workers also transfer from manufacturing and retail trade sales positions. Their experience with a particular product line gives them an advantage over the newcomers to the field because they don't require much on-the-job training.

Sales workers sometimes can augment their on-the-job training with college courses relevant to wholesale distribution. Trade associations also sponsor training programs.

Experienced sales workers with leadership and sales ability may advance to supervisor, sales manager, or other executive positions.

## Job Outlook

Employment opportunities for sales workers in wholesale trade are expected to be good for those with product knowledge and selling ability. In addition to new positions created by increased demand for wholesale trade sales workers, many openings will result from turnover, which is fairly high in this occupation because not all new sales workers find they are suited to the competitive nature of selling.

The number of wholesale sales workers is expected to grow about as fast as the average for all occupations through the 1980's, as the volume and variety of goods produced in the economy expand. Businesses and institutions will require a wide variety of products for their own use and for eventual resale. Most firms will continue to purchase these products from wholesale distributors.

## Earnings

Compensation plans differ among firms. One plan is salary plus a commission based on sales; others are straight commission or straight salary. Some include a bonus. Although most wholesale sales workers have steady, year-round work, sales (and commissions) on products like air conditioners fluctuate through the year. To provide sales workers with a steady income, many companies pay them a "draw" against annual commissions.

Beginning sales workers averaged around $18,500 a year in 1980, according to a Research Institute of America sales compensation survey. Experienced sales workers earned considerably more. Since commissions often make up much of the sales worker's income, earnings vary widely. They also depend on the sales worker's experience and seniority, as well as on the product line. Median earnings of typical sales workers in 1980 varied from $23,000 in hardware, plumbing, and heating materials to $30,800 in lumber and building materials. Median earnings of the highest paid sales workers ranged from $33,000 in food products to $49,500 in lumber and building materials.

## Related Occupations

In addition to sales ability, wholesale trade sales workers often have a knowledge of hundreds of similar products. Some occupations requiring the same skills are buyers, sales-service promoters, manufacturing sales workers, field contact technicians, and demonstrators.

## Sources of Additional Information

Information on jobs in wholesale selling may be obtained directly from local wholesale houses or from associations of wholesalers in many of the larger cities.

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# Administrative Support Occupations Including Clerical

About 19 million people worked in administrative support occupations, including clerical, in 1980. Workers in this group prepare and keep records; operate office machines; arrange schedules and make reservations; collect, distribute, or account for money, material, mail, or messages; or perform similar administrative duties. Data on the number employed in selected occupations are presented in the following table.

While administrative support jobs are located in virtually all industries, they are concentrated in the fast-growing service, trade, and finance sectors. Because of this concentration, these jobs are expected to grow more rapidly than the average for all occupations through the 1980's.

Employers prefer high school graduates for clerical jobs. They look for people who understand what they read, know basic spelling and grammar, and can use arithmetic. The ability to type and do neat, accurate paperwork is required for nearly all entry level positions; some employers give applicants typing or clerical aptitude tests. For jobs such as bank clerks, bookkeepers, cashiers, collection workers, and statistical clerks, an ability to work with numbers is particularly important. For bank teller, hotel clerk, receptionist, and reservation and passenger agent jobs—jobs requiring constant contact with customers—employers seek persons who are pleasant, tactful, and outgoing.

**Table 1. Employment in selected administrative support and clerical occupations, 1980**

| Occupation | Employment |
|---|---|
| Secretary | 2,469,000 |
| General office clerk | 2,395,000 |
| Bookkeeper and accounting clerk | 1,715,000 |
| Typist | 1,067,000 |
| Bank clerk | 988,000 |
| Stock clerk | 822,000 |
| Receptionists | 635,000 |
| Receptionist | 402,000 |
| Switchboard operator/receptionist | 233,000 |
| Computer operating personnel | 558,000 |
| Keypunch operator | 325,000 |
| Computer operator | 184,000 |
| Peripheral equipment operator | 49,000 |
| Bank teller | 480,000 |
| Clerical supervisor | 430,000 |
| Teacher aide | 415,000 |
| Shipping and receiving clerk | 390,000 |
| Telephone operator | 337,000 |
| Stenographer | 280,000 |
| File clerk | 271,000 |
| Order clerk | 250,000 |
| Production clerk | 201,000 |
| Payroll and timekeeping clerk | 179,000 |

SOURCE: Bureau of Labor Statistics.

Many employers prefer applicants who have some knowledge of office practices. High schools, community and junior colleges, business schools, and home study schools teach these skills.

Business education programs typically include courses in typing, shorthand, clerk-typist skills, and office procedures. Work-study programs provide students with experience in a clerical job while still in school.

Whether or not they have had formal business training, beginning clerical workers generally receive on-the-job training. They learn how their employers keep records and become familiar with the kinds of business forms used. Workers may learn to operate adding and duplicating machines or word processing equipment, or learn stock handling or inventory control procedures.

Continuing changes in word processing and computer technology have increased the demand for clerical workers who are sufficiently adaptable and versatile to learn to operate new equipment. Secretaries and typists, for example, may periodically attend classes to learn to operate new word processing equipment, information storage systems, and other automated equipment.

Advancement opportunities for clerical workers are good, and many employers provide courses in skills needed for more demanding jobs. As workers become more highly skilled, they are assigned more difficult tasks. Junior typists, for example, may be promoted to senior typists as their speed and accuracy improve. Receptionists who learn typing and office procedures may become secretaries. Promotion to such jobs as administrative assistant, office manager, or clerical supervisor generally depends on leadership ability, work experience, and knowledge of the organization.

## Sources of Additional Information

Many State employment service offices can provide information about earnings, hours, and employment opportunities in clerical jobs.

Information concerning training for clerical occupations in your State is available from:

State Supervisor of Office Occupations Education, State Department of Education, State capital.

A directory of private business schools located in cities throughout the country may be obtained free of charge from:

Association of Independent Colleges and Schools, 1730 M St. N.W. Suite 600, Washington, D.C. 20036.

For the names of organizations that can provide information about specific occupations, see the discussions of individual clerical occupations that follow.

# Airline Reservation and Ticket Agents

(D.O.T. 011.061, .161.010, and 090.227-010)

## Nature of the Work

In any company, the way in which employees deal with the public and the quality of the service they provide often make the difference between a satisfied customer and a dissatisfied one. In airline companies, reservation and ticket agents provide this important personal contact. These employees reserve seats, sell tickets, and help passengers board planes.

Airline reservation agents work at large central offices. They answer customer telephone inquiries on subjects such as late arrivals and departures, fares, schedules, and cities serviced by their airline. Their main function, however, is to book customer reservations. After finding out where a customer wants to go, when, and from which airport he or she wants to leave, agents check to find out if space is available. Each agent has access to a computer terminal and, by typing instructions on the keyboard, can quickly obtain information on flight schedules and seat availability.

If the plane is full, the agent may suggest an alternate flight. Sometimes agents will check to see if space is available on other airlines flying to the same destination, and may book these seats for the caller, especially if their airline can provide the service on the return trip. If the customer makes a reservation, the agent types his or her name and other information into the computer to reserve the space. Agents also can change or cancel reservations at the customer's request, simply by modifying the record on the computer.

Airline ticket agents work at airports or in downtown ticket offices. Like reservation agents, they book space on flights for customers. But ticket agents also prepare tickets, calculate fares, and accept payment. At airports and a few ticket offices, they also tag passengers' luggage for shipment on the plane.

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These agents handle calls for flight reservations and ticket information.

Ticket agents keep records of passengers on each plane and assist customers with problems such as lost or damaged baggage.

Ticket agents also help passengers board planes. They may use the public address system to announce boarding gates and times. At the gate, these agents collect tickets, issue boarding passes, and sometimes assign seats. They also check to make sure that flight attendants have all the equipment needed for the flight. When passengers are disembarking, agents may provide information on ground transportation and local hotels.

At small airports, ticket agents also may load and unload baggage and freight on the ramp.

## Working Conditions

Although agents generally work 40 hours a week, schedules are irregular since airlines operate flights at all hours. Agents with the least seniority often work nights and weekends.

During holidays and other busy periods, ticket agents may find the work hectic due to the large number of passengers who must be accommodated rapidly. When operations are interrupted, such as when weather conditions lead to delays or rerouting of flights, agents serve as the buffer between the airlines and their customers. Trying to pacify irate passengers under these conditions can be very difficult.

## Employment

In 1980, the airlines employed about 49,000 reservation agents and 37,000 ticket agents. Most worked in downtown ticket and reservation offices and at large metropolitan airports where most airline passenger business originates. Some were employed in smaller communities served by airlines.

## Training, Other Qualifications, and Advancement

Because reservation and ticket agents must deal directly with the public, airlines have strict hiring standards about appearance, personality, and education. A good speaking voice is essential because these employees frequently use the telephone or public address system. High school graduation generally is required, and some college training is preferred. Previous work experience dealing with the public is desirable. Reservation agents must be able to type.

New reservation agents receive about a month of classroom instruction. They are taught company policy and government regulations that cover ticketing procedures and other matters related to the airline. They learn to read schedules, calculate fares, and plan passenger itineraries. They also are taught to use the computer to obtain information on schedules and seat availability, and to reserve space for passengers. They are tested daily and homework usually is assigned. To accommodate large numbers of callers, reservation agents must keep the time spent on each call to a minimum without alienating customers. Thus, learning how to carry on conversations in an organized, yet pleasing manner, is an important part of their training. After completing classroom instruction, new agents work under supervisors or experienced agents for several weeks.

Learning the work of a ticket agent generally requires only a week of classroom instruction. During this time new agents are taught how to tag bags, read tickets and schedules, and assign seats. This is followed by about a week of on-the-job training under an experienced agent. Usually, new ticket agents start by tagging the bags of passengers who already have tickets. As they become more experienced, they learn to reserve space, make out tickets, and handle assignments at the boarding gate.

Advancement opportunities are limited. Some reservation and ticket agents are promoted to supervisory positions and a small number eventually become city and district sales managers for airline ticket offices.

## Job Outlook

Employment of airline reservation and ticket agents is not expected to change significantly through the 1980's. Despite the anticipated increase in airline passengers, growth in the number of agents will be limited as airlines install and upgrade computers to process reservations, keep records, and perform other routine tasks. Although many openings will arise as experienced agents transfer to other jobs, retire, or die, applicants will find considerable competition for openings because the glamour and travel benefits associated with airline jobs attract many people.

Employment of reservation and ticket agents is sensitive to cyclical swings in the economy. Many agents are laid off during recessions when the demand for air travel declines. Until this demand resumes, few new agents are hired.

## Earnings

Ticket agents had estimated weekly earnings of $371 in 1980, according to a survey of airlines. Reservation agents averaged $339. As an added benefit, agents and their immediate families are entitled to reduced fare on their own and many other airlines.

Many agents belong to labor unions. Four unions cover most of the organized agents: The Air Line Employees Association; the Transport Workers Union of America; the Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Employees; and the International Brotherhood of Teamsters, Chaffeurs, Warehousemen and Helpers of America.

## Related Occupations

Other workers who must be friendly and pleasant while providing information or assisting people include ground hosts/hostesses (air transportation), appointment clerks, information clerks, receptionists, and tourist-information assistants.

## Sources of Additional Information

For a pamphlet describing the duties of reservation and ticket agents, write to:

Air Line Employees Association, 5600 S. Central Ave., Chicago, Ill. 60638.

Information about jobs in a particular airline may be obtained by writing to the personnel manager of the company. Addresses of companies are available from:

Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

# Bank Clerks

(D.O.T. 209.687-022; 210.382-014, -018, -022, -026, -058; 216.362-014, -026, and .382-038; 217.382-010, -014; 219.362-062; and 249.382-010)

## Nature of the Work

All organizations need clerks to handle paperwork. Because of the specialized nature of banking, some clerical duties in banks differ from those of other businesses. (Secretaries, typists, receptionists, and other clerical workers whose jobs are much the same in banks as in other businesses are discussed in greater detail elsewhere in the *Handbook*.)

In a small bank, one clerk may do several jobs, such as sorting checks, totaling debit and credit slips, and preparing monthly statements for depositors. In a large bank, however, each clerk usually specializes and frequently has a special job title, as well.

Many bank clerks use office machines unique to banking. Clerks known as *sorters* (D.O.T. 209.687-022) separate documents—checks, deposit slips, and other items—into different groups and tabulate each "batch" so they may be charged to the proper accounts. Often clerks use canceling and adding machines in their work. *Proof-machine operators* (D.O.T. 217.382-010) use equipment

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that sorts checks and deposit slips, adds their amounts, and records the tabulations.

Bookkeeping workers comprise a large group of bank clerks. The job titles of bookkeepers generally reflect the kinds of records they keep—for example, Christmas club bookkeeper, discount bookkeeper, interest-accrual bookkeeper, trust bookkeeper, and commodity loan clerk. *Bookkeeping-machine operators* (D.O.T. 210.382-022 and -026)—sometimes called account clerks, posting machine operators, or recording clerks—run conventional or electronic posting machines to record financial transactions. *Reconcilement clerks* (D.O.T. 210.382-058) process financial statements from other banks to reconcile differences, ensure accuracy, and aid the auditing of accounts. *Trust securities clerks* (D.O.T. 219.362-062) post investment transactions made by trust officers on behalf of bank customers. In addition to duties indicated by their titles, many of these workers do routine typing, calculating, and posting.

Other clerical employees whose duties and job titles are unique to banking include *country-collection clerks* (D.O.T. 216.362-014), who sort thousands of pieces of mail daily and determine which items must be held at the main office and which should be routed to branch banks for collection; *transit clerks* (D.O.T. 217.382-014), who sort checks and drafts on other banks, list and total the amounts involved, and prepare documents to be mailed for collection; *interest clerks* (D.O.T. 216.382-038), who keep records on interest-bearing items that are due to or from the bank; and *mortgage clerks* (D.O.T. 249.382-010), who type legal papers dealing with real estate upon which money has been loaned, and maintain records relating to taxes and insurance on these properties.

Electronic data processing has created several new clerical occupations unique to banking. These include the electronic reader-sorter operator, who runs electronic check sorting equipment; the check inscriber or encoder, who operates machines that print information in magnetic ink on checks and other documents for machine reading; and the control clerk, who keeps track of the large volume of documents flowing in and out of the computer division. Other occupations include card-tape converter operator, coding clerk, console operator, data typist, data converting machine operator, data examination clerk, high-speed printer operator, tape librarian, teletype operator, and verifier operator.

## Working Conditions

Although some bank clerks work evenings or weekends, most generally work about 36 hours per week during normal business hours. Clerks generally do not deal with customers. Much of their work is routine and requires remaining at work stations for extended periods.

## Employment

Banks employed nearly 1,000,000 clerks in 1980. Secretaries, typists, bookkeepers, and office machine operators were among the largest groups of workers. Many clerks work part time.

The never-ending flow of paperwork in banks creates clerical jobs.

## Training, Other Qualifications, and Advancement

High school graduation is considered adequate preparation for most beginning clerical jobs in banks. Most clerks have at least a high school education. Courses in bookkeeping, typing, business arithmetic, and office machine operation are desirable. Applicants may be given brief tests to determine their ability to work rapidly and accurately, and to communicate effectively with others. They should be able to work under close supervision as part of a team.

Beginners often are hired as file clerks, keypunch operators, transit clerks, or clerk-typists. Most new employees receive some form of in-service training. While a few may start as messengers, others immediately begin training to operate various office machines.

A clerk in a routine job may be promoted to a clerical supervisory position, to teller or credit analyst, and eventually to senior supervisor. Advancement to a bank officer position is a possibility for outstanding clerks who have had college training or have taken specialized courses in banking. Additional education—particularly courses offered by the American Institute of Banking (AIB)—may help clerks and other workers advance. The institute, which is an arm of the American Bankers Association and has over 400 chapters in cities across the country and numerous study groups in small communities, also offers correspondence study and assists local banks in conducting cooperative training programs. The great majority of banks use AIB facilities; many banks use other training sources as well. In general, promotion depends upon the worker's performance, qualifications, and motivation as well as the available openings.

## Job Outlook

Employment of bank clerks is expected to grow faster than the average for all occupations through the 1980's. In addition to opportunities stemming from growth in the industry, many jobs will arise from the need to replace the large number of clerks who die, retire, or leave their jobs for other reasons each year. As a result, banking should continue to be a good source of steady full-time and part-time employment for clerical workers.

Jobs for clerks will arise as established banks expand their services and new banks and branches open. Employment growth will differ markedly among individual clerical occupations. Nearly all banks use electronic equipment that lessens demand for workers such as check sorters and bookkeeping machine operators. Moreover, the need for key-

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punch operators is declining as banks shift from punched card to magnetic tape-based computer systems.

New technologies, however, are unlikely to displace large numbers of workers. Overall, the banking industry and employment of clerks in the industry are expected to grow. Workers whose duties are given to a machine most likely will be reassigned to new jobs created by the change or to duties related to new banking services.

Further, employment of bank clerks is not affected by slowdowns in economic activity because cyclical swings in the economy seem to have little immediate effect on banking activities.

## Earnings

Salaries for clerical workers vary widely, depending upon the worker's actual position and length of experience, as well as the size and location of the bank. Based on a survey of banks, an inexperienced typist usually earned between $130 and $160 a week in 1980. Among experienced workers, the lowest paid file clerks earned between $130 and $160 a week, while the highest paid secretaries earned between $220 and $340 a week. In general, financial institutions have paid clerical workers lower salaries than have firms in other industries, such as wholesale trade or manufacturing.

## Related Occupations

Many clerical skills and abilities required in banking also are needed in other sectors of the financial community and in many other industries. For example, accounting clerks combine an ability to record and compute numerical data with a knack for concentrating on detail to provide and maintain accurate, comprehensive, and up-to-date financial records. Other clerical workers who perform similar duties include audit clerks, bookkeepers, claims examiners, payroll clerks, and timekeepers.

Administrative clerks perform a variety of office tasks, including preparing correspondence, running errands, and maintaining records. Others who perform similar tasks include insurance, mortgage, real-estate, securities, and court clerks.

Bank messengers gather, sort, and distribute various items and documents within and outside the bank. Other workers who similarly process information include correspondence clerks, expediters, mail handlers, and medical record technicians.

Proof-machine operators employ concentration and finger dexterity to process large amounts of financial data quickly and accurately. Other occupations requiring similar capabilities in the operation of machines include billing machine operators, keyboard operators, Linotype operators, tabulating machine operators, and typists.

## Sources of Additional Information

General information about banking occupations, training opportunities, and the banking industry itself is available from:

American Bankers Association, Bank Personnel Division, 1120 Connecticut Ave. NW., Washington, D.C. 20036.

National Association of Bank Women, Inc., National Office, 500 N. Michigan Ave., Chicago, Ill. 60611.

National Bankers Association, 499 S. Capitol St. SW., Suite 520, Washington, D.C. 20003.

Information on careers with the Federal Reserve System is available from:

Board of Governors, The Federal Reserve System, Personnel Department, Washington, D.C. 20551, or from the personnel department of the Federal Reserve bank serving each geographic area.

State bankers' associations can furnish specific information about job opportunities in their State. And writing directly to a particular bank to inquire about job openings can produce favorable results. For the names and addresses of banks in a specific location as well as the names of their principal officers, consult one of the following directories, which are published twice each year:

*The American Bank Directory* (Norcross, McFadden Business Publications).

*Bankers Directory-The Banker's Blue Book* (Chicago, Rand McNally International).

*Polk's World Bank Directory* (Nashville, R.L. Polk & Co.).

# Bank Tellers

(D.O.T. 205.362-026; 211.132-010, .362-014, -018, -022, -026; 216.362-018 and 219.462-010)

## Nature of the Work

Most bank customers have contact with the teller, the individual who cashes checks and processes deposits or withdrawals. Many banks employ one or two "all-purpose" tellers; larger banks employ tellers in more specialized functions. One teller, for example, sells savings bonds; another accepts payment for customers' utility bills. A third receives deposits for Christmas club accounts; and a fourth keeps records and performs the necessary paperwork for customer loans. Still other tellers handle foreign currencies, sell travelers' checks, or compute interest on savings accounts. Banks employed about 480,000 tellers in 1980, many of whom worked part time.

Commercial tellers, the most common kind of teller, cash customers' checks and handle deposits and withdrawals from checking and savings accounts. Before cashing a check, the teller must see that the written and numerical amounts agree, verify the identity of the person to receive payment, and be certain that the account has sufficient funds to cover the check. The teller must carefully count out the cash to avoid errors. Often a customer withdraws money in the form of a cashier's check, which the teller types up and verifies. When accepting a deposit, the teller checks the accuracy of the deposit slip and enters the total in a passbook or on a deposit receipt. Tellers may use machines to make change and total deposits. In some banks, tellers use computer terminals to record deposits and withdrawals. In other banks, they write deposit receipts and passbook entries by hand.

Tellers' duties begin before and continue after banking hours. They begin the day by receiving and counting an amount of working cash for their drawer; this amount is verified by a supervisor, usually the head teller. Tellers use this cash for payments during the day and are responsible for its safe and accurate handling. After banking hours, tellers count cash on hand, list the currency-received tickets on a settlement sheet, and balance the day's accounts. They also sort checks and deposit slips. Paying and receiving tellers may supervise one clerk or more.

## Working Conditions

Although some tellers work evenings or on Saturdays, most generally work during the day, Monday through Friday. Continual communication with customers, repetitive tasks, and prolonged standing within a fairly small area characterize the job.

## Training, Other Qualifications, and Advancement

In hiring tellers, banks seek people with these basic qualities: Clerical skills, friendliness, and attentiveness. Although not required, a high school diploma is generally preferred. Most tellers have at least a high school education. Maturity, neatness, tact, and courtesy are also important because customers deal with tellers far more frequently than with other bank employees. Although a teller works independently, his or her record-keeping is closely supervised. One should enjoy working with numbers and feel comfortable handling large amounts of money.

New tellers usually observe experienced workers for a few days before doing the work themselves. Training may last from a few days to 3 weeks or longer. Beginners usually start as commercial tellers; in large banks which have a separate savings teller's "cage," they may start as savings tellers. Often banks simultaneously train tellers for other clerical duties. (See the statement on bank clerks elsewhere in the *Handbook*.)

The conditions governing advancement of tellers are much the same as those for clerks. The teller interested in promotion has access to education and other sources of additional training. Such self-improvement efforts, coupled with excellent performance on the job, would make a teller an attractive candidate for promotion. After gaining experience, a teller in a large bank may advance to head teller; outstanding tellers who have had some college or specialized training offered by the banking industry may be promoted to officer or a managerial position. Tellers and other support personnel can prepare for better jobs through courses offered by the American Institute of Banking (AIB), an arm of the American Bankers Association. The institute, which has over 400 chapters in cities across the country and numerous study

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groups in small communities, also offers correspondence study and assists local banks in conducting cooperative training programs. The great majority of banks use AIB facilities; many banks use other training sources as well.

## Job Outlook

The number of bank tellers is expected to increase faster than the average for all occupations through the 1980's as banks expand services. Thousands of openings will occur each year as a result of growth in demand for tellers and the need to replace tellers who retire, die, or leave the occupation for other reasons. The relatively high replacement needs in this occupation are expected to be an important source of job opportunities. Qualified applicants should find good employment prospects for both full-time and part-time employment.

Although increased use of mechanical and electronic equipment may eliminate some routine duties and speed other work, total employment is not likely to be adversely affected. Further, since cyclical swings in the economy seem to have little immediate effect on banking activities, tellers generally continue to work even during economic downturns.

## Earnings

Based on a survey of banks, most beginning tellers earned between $130 and $160 a week in 1980. Salaries of experienced tellers varied, depending upon the length of service, the location and size of the bank, and the worker's specific duties. Most savings tellers, for example, earned between $150 and $190 a week in 1980, while note tellers usually earned between $170 and $230 a week. In general, the greater the range of responsibilities the teller performs, the higher the salary.

## Related Occupations

Tellers combine a knowledge of bank procedures with quickness and accuracy to exchange money, checks, and other financial items with customers. Other workers with similar duties include cashiers, toll collectors, post office clerks, auction clerks, and ticket sellers.

## Sources of Additional Information

General information about banking occupations, training opportunities, and the banking industry itself is available from:

American Bankers Association, Bank Personnel Division, 1120 Connecticut Ave. NW., Washington, D.C. 20036.

National Association of Bank Women, Inc., National Office, 500 N. Michigan Ave., Chicago, Ill. 60611.

National Bankers Association, 499 S. Capitol St. SW., Suite 520, Washington, D.C. 20003.

Information on careers with the Federal Reserve System is available from:

Board of Governors, The Federal Reserve System, Personnel Department, Washington, D.C. 20551, or from the personnel department of the Federal Reserve bank serving each geographic area.

Bank tellers spend most of their time serving customers.

State bankers' associations can furnish specific information about job opportunities in their State. And writing directly to a particular bank to inquire about job openings can produce favorable results. For the names and addresses of banks in a specific location as well as the names of their principal officers, consult one of the following directories, which are published twice each year:

*The American Bank Directory* (Norcross, McFadden Business Publications).

*Bankers Directory-The Banker's Blue Book* (Chicago, Rand McNally International).

*Polk's World Bank Directory* (Nashville, R.L. Polk & Co).

# Bookkeepers and Accounting Clerks

## Nature of the Work

Every business needs systematic and up-to-date records of accounts and business transactions. Bookkeepers and accounting clerks maintain these records in journals and ledgers and on other accounting forms. They also prepare periodic financial statements showing all money received and paid out. The duties of bookkeeping workers vary with the size of the business. However, virtually all of them use calculating machines each day. Many use check-writing and bookkeeping machines.

In many small firms, a general bookkeeper handles all the bookkeeping. He or she analyzes and records all financial transactions, such as orders and cash sales. General bookkeepers also check money taken in against money paid out to be sure accounts "balance," calculate the firm's payroll, and make up employees' paychecks. General bookkeepers also prepare and mail customers' bills and answer telephone requests for information about orders and bills.

In large businesses, several bookkeepers and accounting clerks work under the direction of a head bookkeeper or accountant. In these organizations, bookkeeping workers often specialize in certain types of work. Some, for example, prepare statements of a company's income from sales or its daily operating expenses. Some enter information on accounts receivable and accounts payable into a computer and review computer printouts for accuracy and completeness. Others record business transactions, including payroll deductions and bills paid and due, and compute interest, rental, and freight charges. They also may type vouchers, invoices, and other financial records.

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Bookkeepers maintain records of accounts and business transactions.

## Working Conditions

For the most part, working conditions for bookkeepers and accounting clerks are the same as those for other office employees in the same company. Bookkeeping requires sitting for long periods and involves examining detailed numerical information. Some persons may find this tiring. Workers who operate older bookkeeping machines may be exposed to high noise levels. Newer equipment is relatively quiet, however.

## Employment

About 1,700,000 persons were employed as bookkeepers and accounting clerks in 1980. Jobs for bookkeeping workers are found throughout the economy—in business firms mostly, but also in schools, hospitals, nonprofit organizations, and government agencies. Approximately 1 bookkeeper in 3 works for a retail or wholesale firm.

## Training, Other Qualifications, and Advancement

High school graduates who have taken business arithmetic, bookkeeping, and principles of accounting meet the minimum requirements for most bookkeeping jobs. Many employers prefer applicants who have completed business courses at a community or junior college or business school. The ability to use bookkeeping machines and computers is an asset. A knowledge of typing also is useful.

Training for this occupation is widely available. Bookkeeping is taught in high schools, community and junior colleges, and business schools and colleges. Business education programs typically include bookkeeping-accounting, business law, business arithmetic, office practices, and principles of data processing and computer operation for office workers. Some programs give business students an opportunity to learn on the job through work-study programs arranged by high schools and local businesses. The work experience, together with the first-hand knowledge of office procedures, can help when students look for jobs after graduation.

In a few States, bookkeepers and accounting clerks who work on tax returns must be licensed. State licensing agencies can provide information on the requirements in your area.

Bookkeeping workers need to be good at working with numbers and concentrating on details. Small mistakes can be very serious in this field, so bookkeepers need to be careful, accurate, and orderly in their work. Because they often work with others, bookkeepers should be cooperative and able to work as part of a team.

Newly hired bookkeeping workers begin by recording routine transactions such as accounts receivable or accounts payable. As they gain experience, they advance to more responsible assignments, such as preparing income statements, reconciling accounts, and reviewing computer printouts.

Some bookkeeping workers are promoted to supervisory jobs. Others who enroll in college accounting programs may advance to jobs as accountants. Bookkeeping experience provides a good background for college courses in accounting but normally cannot be credited towards a degree in accounting.

## Job Outlook

Jobs for bookkeepers and accounting clerks will be numerous through the 1980's. Employment is expected to grow about as fast as the average for all occupations. The occupation is large and turnover is high; thus many openings will occur because of the need to replace workers who transfer to other occupations, retire, or die.

The volume of business transactions is expected to grow rapidly, with a corresponding increase in the need for accounting records. However, the need for bookkeeping workers, who maintain these records, will not increase as fast, because of the increasing use of advanced computers that process data more accurately, rapidly, and economically than older computers or workers processing it by hand.

## Earnings

Beginning accounting clerks in private firms averaged $9,575 a year in 1981, according to a Bureau of Labor Statistics survey. Most experienced accounting clerks averaged between $11,431 and $13,454 per year, while senior level accounting clerks averaged $16,886 per year.

In early 1981, the starting salary in the Federal Government was $8,951 for bookkeeping workers right out of high school. Those who had 1 year of experience or 1 year of education beyond high school could start at $9,766.

## Related Occupations

Workers in a number of other jobs also must be good at working with numbers. Among such workers are bank tellers, collection workers, insurance clerks, and statistical clerks.

## Sources of Additional Information

See the statement on administrative support occupations for sources of additional information.

# Claim Representatives

(D.O.T. 168.267-014, 191.167-014, 205.367-018, 241.217-010, .362-010 and .267-018)

## Nature of the Work

Fast and fair settlement of all claims is essential to any insurance company for meeting its commitments to policyholders and protecting its own financial position. The people who investigate claims, negotiate settlement with policyholders, and authorize payment are known as claim representatives—a group that includes claim adjusters and claim examiners.

When a property-liability (casualty) insurance company receives a claim, the *claim adjuster* determines whether the policy covers it and the amount of the loss. Adjusters use reports, physical evidence, and testimony of witnesses in investigating a claim. When their company is liable, they negotiate with the claimant and settle the case.

Adjusters must make sure that settlements reflect the claimant's actual losses. They must protect their company from false or inflated claims but, at the same time, settle valid claims fairly and promptly. Some adjusters are allowed to issue checks on company funds; most, however, submit their

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findings to claim examiners who review them to insure that proper procedures have been followed and then authorize payment.

Some adjusters work with all lines of insurance. Others specialize in claims from fire damage, marine loss, automobile damage, workers' compensation loss, or product liability. Several States have "no-fault" automobile insurance plans that relieve the adjuster from determining responsibility for a loss. Adjusters in these States still must decide the amount of loss, however. A growing number of casualty companies employ special adjusters to settle small claims, usually minor automobile or homeowner damage claims. These workers, generally called "inside adjusters" or "telephone adjusters," contact claimants by telephone or mail and have the policyholder send repair costs, medical bills, and other statements to the company. Many companies centralize this operation in a drive-in claims center where the cost of repair is determined and a check is issued on the spot.

Adjusters work away from the office most of the time. They may be called to the site of an accident, fire, or burglary. Adjusters plan and schedule the activities needed to dispose of a claim. They keep written or taped records of information obtained from witnesses and other sources and prepare reports of their findings.

In life and health insurance companies, the counterpart of the claim adjuster is the *claim examiner*, who investigates questionable claims or those exceeding a specified amount. Examiners may check claim applications for completeness and accuracy, interview medical specialists, consult policy files to verify information on a claim, or calculate benefit payments. Generally, examiners are authorized to investigate and approve payment on all claims up to a certain limit; larger claims are referred to a senior examiner.

Examiners checking incorrect or questionable claims correspond with investigating companies, field managers, agents, or the family of the insured. Claim examiners occasionally travel to obtain information by personal interview, or contact State insurance departments and other insurance companies. In addition to verifying claims and approving payment, examiners also maintain records of settled claims and prepare reports to be submitted to their company's data processing department. Some experienced examiners serve on committees, conduct surveys of claim practices within their company, and help devise more efficient ways to process claims. They, like claim adjusters, sometimes testify in court on contested claims.

Claim adjuster inspects automobile damage to determine amount of the loss.

## Working Conditions

Claim adjusting is not a desk job. It requires that a person be physically fit because much of the day may be spent in traveling, walking outdoors, and climbing stairs. Adjusters may have to work evenings or weekends to interview witnesses and claimants. Since most companies provide 24-hour claim service to their policyholders, some adjusters always must be on call. Occasionally, an experienced adjuster may travel to the scene of a disaster, such as a hurricane or a riot, to work with local personnel. Some cases may require travel outside the United States.

Claim examiners have desk jobs that require no unusual physical activity. Although the average workweek for examiners is 35 to 40 hours, they may work longer at times of peak claim loads or when quarterly and annual statements are prepared. They also may travel occasionally.

## Employment

About 210,000 persons worked as claim representatives in 1980. Most claim adjusters worked for almost 2,900 insurance companies that sell property and liability coverage. Some were employed by independent adjusting firms that contract for their services for a fee. These independent firms ranged from national companies employing hundreds of adjusting specialists to small 3- or 4-person local operations. A relatively small number of adjusters represent the insured rather than the insurance company. These "public adjusters" are retained by individuals, government agencies, banks, financial organizations, and business firms to negotiate their claims against insurance companies for fire and allied property losses.

Most claim examiners worked for life insurance companies in large cities, such as New York, San Francisco, Chicago, Dallas, and Philadelphia, where most home offices are located.

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## Training, Other Qualifications, and Advancement

Although a growing number of insurance companies prefer college graduates, many hire those without college training, particularly if they have specialized experience. For example, persons experienced in automobile repair may qualify as auto adjusters, and those with clerical experience might be hired as inside adjusters.

No specific field of college study is recommended. Although courses in insurance, economics, or other business subjects are helpful, a major in almost any field is adequate preparation. An adjuster who has a business or accounting background might specialize in financial loss from business interruption or damage to merchandise. College training in engineering is helpful in adjusting industrial claims. A legal background is most helpful to those handling workers' compensation and product liability cases.

Most large insurance companies provide on-the-job training and home study courses to beginning claim adjusters and examiners. Claim representatives are encouraged to take courses designed to enhance their professional skills. For example, the Insurance Institute of America offers a six-semester study program leading to an associate degree in claims adjusting upon successful completion of six examinations. Adjusters can prepare for these examinations by independent home study or through company or public classes. A professional Certificate in Insurance Adjusting also is available from the College of Insurance in New York City.

The Life Office Management Association (LOMA), in cooperation with the International Claim Association, offers a claims education program for life and health examiners. The program is part of the LOMA Institute Insurance Education Program leading to the professional designation, Fellow, Life Management Institute (FLMI), upon successful completion of eight written examinations.

Most States require adjusters to be licensed. Applicants usually must comply with one or more of the following: Pass a written examination covering the fundamentals of adjusting; complete an approved course in insurance or loss adjusting; furnish character references; be at least 20 or 21 years of age and a resident of the State; and file a surety bond.

Because they often work closely with claimants, witnesses, and other insurance professionals, representatives must be able to adapt to many different persons and situations. They should be able to communicate effectively and gain people's respect and cooperation. For example, when adjusters' evaluations of claims differ from those of the persons who have suffered the loss, they should be able to explain their conclusions clearly and tactfully. Examiners need to understand medical and legal terms and practices and Federal and State insurance laws and regulations. Since they may have to check premium payments, policy values, and other numerical items in processing a claim, examiners should be adept at making mathematical calculations. Both adjusters and examiners should have a good memory and enjoy working with details.

Beginning adjusters and examiners work on small claims under the supervision of an experienced worker. As they learn more about claim investigation and settlement, they are assigned claims that are higher in loss value and more difficult. Trainees are promoted as they demonstrate competence in handling assignments and as they progress in their course work. Because of the complexity of insurance regulations and claims procedures, workers who lack formal academic training may advance more slowly than those with 2 or more years of college. Employees who show competence in claims work or administrative skills may be promoted to department supervisor in a field office or to a managerial position in the home office. Qualified adjusters and examiners sometimes transfer to underwriting or sales departments.

## Job Outlook

Employment of claim representatives is expected to grow faster than the average for all occupations through the 1980's as the number of insurance claims continues to increase. In addition to jobs created by growth in the need for these workers, many jobs will result from the need to replace workers who die, retire, or transfer to other jobs.

Several factors point to a growing volume of insurance and a resulting need for claim adjusters. Over the next decade many more workers will be in the 25-54 age group. People in this group have the greatest need for life and health insurance and protection for homes, automobiles, and other possessions. New or expanding businesses will need protection for new plants and equipment and for insurance covering their employees' health and safety.

As ways of doing business continue to change, the demand for certain kinds of claim adjusters will be stronger than for others. For example, the growing trend toward drive-in claim centers and claim handling by telephone should reduce the demand for automobile adjusters while it stimulates demand for inside adjusters. Independent adjusters who specialize in automobile damage claims should continue to suffer some loss of business. Prospects should be excellent, however, for adjusters who specialize in complex business insurance such as marine cargo, workers' compensation, product and pollution liability, and kidnap and ransom insurance.

## Earnings

According to a survey of property and liability companies, claim adjusters earned a median salary of $15,000 a year in 1980; senior adjusters earned about $22,000 a year. Most public adjusters are paid a percentage of the amount of the settlement. Adjusters are furnished a company car or are reimbursed for use of their own vehicles for business purposes. A survey by the Life Office Management Association revealed that experienced individual life claim examiners earned average salaries of $16,000 a year in 1980 and their supervisors earned average salaries of about $21,000. According to the survey of property and liability companies, casualty claim examiners earned a median salary of $20,500. Claim supervisors in casualty companies earned a median salary of $21,500 a year.

Most insurance companies have liberal vacation policies and other employee benefits. Almost all insurance companies provide employer-financed group life and retirement plans.

## Related Occupations

Other workers who have to make decisions on the basis of financial data include auditors, loan officers, credit managers, and real estate appraisers.

## Sources of Additional Information

General information about a career as a claim examiner or adjuster is available from the home offices of many life and property and liability insurance companies.

Information about licensing requirements for claim adjusters may be obtained from the department of insurance in each State.

Information about career opportunities in these occupations also may be obtained from:

Insurance Information Institute, 110 William St., New York, N.Y. 10038.

Alliance of American Insurers, 20 N. Wacker Dr., Chicago, Ill. 60606.

The National Association of Independent Insurers, Public Relations Department, 2600 River Rd., Des Plaines, Ill. 60018.

National Association of Independent Insurance Adjusters, 175 West Jackson Blvd., Chicago, Ill. 60604.

For information about public insurance adjusting, contact:

National Association of Public Adjusters, 131 East Redwood St., Suite 210, Baltimore, Md. 21202.

Career information on life insurance claim examining is available from:

American Council of Life Insurance, 1850 K St. NW., Washington, D.C. 20006.

# Collection Workers

(D.O.T. 241.357-010, .367-010, -022, and -026)

## Nature of the Work

Companies that lend money or extend credit expect to be paid on time. However, customers who "buy now" do not always "pay later." Collection workers, often called bill collectors or collection agents, help maintain a company's financial well-being by keeping delinquent and bad debts to a minimum.

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A collector's primary job is to persuade people to pay their unpaid bills. The collector usually receives a bad debt file after normal billing methods, such as monthly statements and collection form letters, have failed to elicit payment. The file contains information about the debtor, the nature and amount of the unpaid bill, the last charge incurred, and the last time payment was made.

The collector then contacts the debtor by phone or mail, inquires why the bill is still unpaid, and tries to get the debtor to pay or make new arrangements for payment. In some cases, people do not pay a bill because they feel that the bill is incorrect, that the merchandise they bought is faulty, or that services they were billed for were not properly performed. In these cases, collectors recommend that the debtors resolve these disagreements by contacting the original sellers. If the problems are not settled, the collectors again contact the customers to convince them that they were properly charged and should pay the debts.

When customers have financial emergencies or have mismanaged their money, collectors may work out new payment schedules. If collectors find customers fraudulently avoiding payment of their bills, they may recommend that the files be turned over to an attorney.

When a debtor moves without leaving a forwarding address, the collector may inquire at the post office, search telephone directories, and call on references listed on the original credit application. In large collection operations, this may be done by collection workers known as skip tracers.

In small organizations, bill collectors may perform other functions besides contacting delinquent customers. They may advise customers with financial problems, or contact customers to determine if they are satisfied with the way their accounts are being handled.

Some collection workers, called repossessors, are employed by creditors to locate and return goods such as automobiles and furniture which have not been paid for.

## Working Conditions

Since collectors make their contacts by telephone, they spend most of their time in an office. On rare occasions, a collector may visit the debtor. While their workplaces are usually pleasant, collectors may have to take verbal abuse from hostile customers. Most collectors work 40 hours a week. In order to catch people at home, some work flexible schedules, that is, they start late and work into the evening, or take off on a weekday and work on Saturday. Some collectors work part time during evenings and weekends.

## Employment

About 89,000 collection workers were employed in 1980. Most collectors are employed by commercial banks, finance companies, credit unions, and collection agencies. Others work for retail and wholesale businesses and public utilities.

Jobs for collectors are located throughout the United States, but most are in heavily populated urban areas. Many firms with branch offices in rural areas locate their collection departments in nearby cities.

## Training, Other Qualifications, and Advancement

A high school education usually is sufficient for entry into the collection field. Because a collector handles delinquent accounts on a person-to-person basis, high school courses in psychology and speech may be useful.

Entry level collectors are generally given on-the-job training by a supervisory employee or experienced worker who helps them learn collection procedures and telephone techniques.

Training also is available through the American Collectors Association, which holds special seminars throughout the country to assist collectors in improving their collection and skip tracing techniques.

A collector's most valuable asset is the ability to get along with people without antagonizing them. He or she must be alert, imaginative, and quick-witted to handle the awkward situations that are part of collection work. While collectors should be sympathetic to the billpayers' problems, they also must be persuasive, tactful, and assertive to overcome some debtors' reluctance to fulfill their financial obligations. Because a collector spends most of the day on the telephone, a pleasant speaking voice and manner are important.

Collectors with above-average abilities may become collection managers or supervise a staff of collectors. A few collection workers progress to other positions in the credit field, such as credit authorizer, bank loan officer, or credit manager.

## Job Outlook

Employment of collection workers is expected to grow about as fast as the average for all occupations through the 1980's as a result of the increasing volume of credit purchases. While this growth will create some new jobs, a much more significant source of openings is the high turnover in this occupation. Many people find the job of persuading people to pay their bills to be distasteful, and leave, as do those whose earnings are low because they do not collect enough debts. For these reasons, employers also have difficulty recruiting people for this occupation. Therefore, job applicants with the necessary aptitudes and temperament have good prospects for landing a job. The strongest competition for collection positions will be in large metropolitan banks that generally offer higher salaries and better opportunities for advancement than other employers.

The demand for collection workers through the 1980's will be spurred by the expansion of credit card services and the further growth of retail stores. Delinquent accounts are an unavoidable aspect of the credit system. As businesses extend attractive credit terms for the purchase of more goods and services to more and more people, the number of delinquent accounts can be expected to increase. Additional "callers" will be required to service these accounts on an individual basis.

A collector's main job is to persuade people to pay their unpaid bills.

## Earnings

Incomes of collection workers vary substantially because employers generally pay salary plus a commission or bonus based on the amount of debts collected. Limited information available indicates that beginning collectors averaged $9,000 a year in 1980; experienced collectors averaged between $12,000 and $15,000.

## Related Occupations

Many other workers deal with customers to adjust claims and arrange for payment of debts. Some of these workers are customer-complaint clerks, credit analysts, credit reporters, and loan counselors.

## Sources of Additional Information

Information on jobs as collection workers as well as other positions in a credit collection office is available from:

American Collectors Association, 4040 W. 70th St., Minneapolis, Minn. 55435.

# Computer Operating Personnel

(D.O.T. 203.582-022, -026, -030, -046, -070; 206.387-030; 208.685-030; and 213.132-010 and -014, .362-010, .382-010, and .685-010)

## Nature of the Work

All data systems require specialized workers to enter data and instructions, operate the computer, and retrieve the results. The data

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to be processed and the instructions for the computer are called "input;" the results are called "output."

Information is entered into a computer system by data entry personnel in a variety of ways. In some systems, *keypunch operators* prepare input by punching patterns of holes in computer cards to represent specific letters, numbers, and special characters, using a machine similar to a typewriter. In others, *data typists* use special machines that convert the information they type to holes in cards or magnetic impulses on tapes or disks. Most newer systems are capable of remote data entry. The user sits at a machine equipped with a typewriter keyboard and an electronic screen that displays the data as they are entered directly into the computer. In some newer systems, data enter the computer at the source of the transaction being recorded, for example, at the loading dock or at a supermarket checkout line.

Once the input is coded—prepared in a form the computer can read—it is ready to be processed. *Console operators*, who monitor and control the computer, decide what equipment should be set up for each job by examining the special instructions that the programmer has written out. To process the input, they make sure the computer has been loaded with the correct cards, magnetic tapes, or disks, and then start the computer. While it is running, they watch the computer console, paying special attention to signals, such as error lights, that could indicate a malfunction. If the computer stops or an error is signalled, operators must locate the problem and solve it or terminate the program.

In some systems, devices directly connected to the computer provide output in the form desired by the programmer. In others, high-speed printers or card-tape-converters run by auxiliary equipment operators—*high-speed printer operators* and *card-tape-converter operators*—perform this function.

Frequently, data on punched cards, magnetic tape, or disks are kept for future use. *Tape librarians* classify and catalog this material and maintain files of current and previous versions of programs, listings, and test data. In smaller organizations, librarians may do some data entry as well as coordinate the activities of the programmer and the operations department.

Computer operator refers to manual in order to solve a problem.

## Working Conditions

Because electronic computers must be operated at carefully controlled temperatures, operators work in well-ventilated rooms; air-conditioning counteracts the heat generated by machine operations. When the equipment is operating, however, the computer room can be noisy.

Some console and auxiliary equipment operators work evening or night shifts because many organizations use their computers 24 hours a day. Tape librarians usually work only day shifts.

## Employment

About 558,000 persons worked as console, auxiliary equipment, and keypunch operators in 1980.

Although workers in these occupations are employed in almost every industry, most work in manufacturing firms, wholesale and retail trade establishments, and firms that provide data processing services for a fee. Many additional computer and peripheral equipment operators work for insurance companies, banks, and government agencies.

## Training, Other Qualifications, and Advancement

In firms that have just installed a new computer system, tabulating and bookkeeping machine operators may be transferred to jobs as keypunch or auxiliary equipment operators, or console operators. Most often, however, employers recruit workers who already have the necessary skills to operate the equipment.

Many high schools, public and private vocational schools, private computer schools, business schools, and community or junior colleges offer training in computer operating skills. The military services also offer valuable training in a number of computer skills. In addition, a growing number of business firms across the country hold weekend seminars on data processing for high school students. Similarly, computer professional associations encourage student participation in professional conferences.

Employers in private industry usually require a high school education, and many prefer to hire console operators who have some community or junior college training,

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especially in data processing. The Federal Government requires a high school diploma, unless applicants have had specialized training or experience. Many employers test applicants to determine their aptitude for computer work, particularly their ability to reason logically. Keypunch operators and other data entry personnel often are tested for their ability to work quickly and accurately.

Beginners usually are trained on the job. The length of training needed varies—auxiliary equipment operators can learn their jobs in a few weeks, but console operators require several months of training because they must become sufficiently familiar with the computer equipment to be able to identify the causes of equipment failures.

Keypunch and auxiliary equipment operators should be able to work under close supervision as part of a team. They also must feel comfortable working with machines and doing repetitive, organized tasks. Console operators, however, must use independent judgment, especially when working without supervision on second and third shifts.

Advancement opportunities for keypunch and auxiliary equipment operators are limited because data entry techniques are becoming more specialized. However, promotion to a supervisory position is possible after several years on the job. With additional training, often including community or junior college study, a few operators advance to jobs as console operators.

Console operators also may be promoted to supervisory positions, or to jobs that combine supervision and console operation. Through on-the-job experience and additional training, some console operators advance to jobs as programmers.

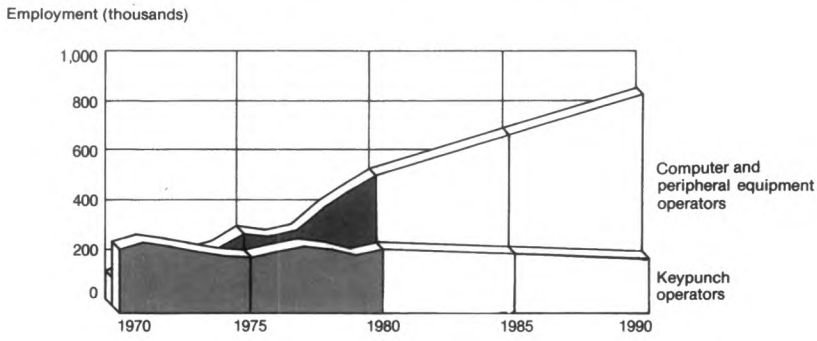
## Job Outlook

Changes in data processing technology will have differing effects on computer operating occupations. Employment of console and peripheral equipment operators, for example, is expected to rise much faster than the average for all occupations through the 1980's. Employment of keypunch operators, on the other hand, should continue to decline.

Recent advances in miniaturizing circuits have enabled manufacturers to reduce both the size and the cost of computer components. As this technology develops, a continued expansion in the use of computers is expected, especially by small businesses. Employment of console and peripheral equipment operators in data processing service firms may grow less rapidly than in the past as more small firms install their own computer systems, but overall demand for these workers should remain fairly strong.

This same technology will further reduce demand for keypunch operators. The primary reason for this decline is the increased use of computer terminals and storage of data on disks and cassettes. As direct data entry techniques continue to become more efficient, the importance of punched cards as a form of input will diminish. Despite the anticipated decline in employment, many openings will occur each year as workers transfer to other occupations, retire, or die.

**Technological advances will increase the need for computer and peripheral equipment operators but lessen the demand for keypunch operators**




Source: Bureau of Labor Statistics

## Earnings

Weekly earnings of keypunch operator trainees in private industry averaged around $200 in 1980, according to surveys conducted in urban areas by the Bureau of Labor Statistics and firms engaged in research on data processing occupations. Lead operators earned from $220 to $250 weekly.

Weekly earnings of beginning console operators averaged about $205. Experienced workers earned from $240 to $300, and lead operators earned from $300 to $375 weekly. Average weekly earnings for tape librarians in 1980 were $230.

In the Federal Government, console operators and keypunch operators without work experience started at about $140 a week in early 1981. Throughout the economy in 1980, console operators earned slightly more and keypunch operators earned slightly less than average earnings for all nonsupervisory workers in private industry, except farming.

## Related Occupations

Other occupations in which workers organize data and process information on electronic equipment include secretaries and typists, printing typesetters and compositors, transcribing machine operators, and file clerks.

## Sources of Additional Information

Further information on data processing careers is available from:

American Federation of Information Processing Societies, 1815 North Lynn St., Arlington, Va. 22209.

# Hotel Front Office Clerks

(D.O.T. 238.362-010 and .367-030)

## Nature of the Work

Handling room reservations, greeting guests, issuing keys, and collecting payments are among the duties performed by hotel and motel front office clerks. Because many smaller hotels and motels require minimal staffs, the front office clerk may also function as a bookkeeper, cashier, or telephone operator. Large hotels, however, usually employ several front office clerks to perform various services, such as receiving mail, providing information, or issuing keys. About 80,000 persons worked as front office clerks in 1980.

*Room* or *desk clerks* assign rooms to guests and answer questions about hotel services, checkout time, or parking facilities. In assigning rooms, they must consider guests' preferences while trying to maximize hotel revenues. These clerks fill out guests' registration forms and sometimes collect payments. Room clerks are always in the public eye and, through their attitude and behavior, greatly influence guests' impressions and promote a hotel's reputation.

*Reservation clerks* record written or telephoned requests for rooms, prepare registration forms, and notify room clerks of guests' arrival times.

*Rack clerks* keep records of room assignments to advise housekeepers, telephone operators, and maintenance workers that rooms are occupied.

## Working Conditions

Since hotels are open around the clock, night and weekend work is common. While

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A job as a front office clerk can lead to a career in hotel management.

hotel clerks work on shifts, fewer employees work at night than during the day.

Hotel clerks sometimes must stand for prolonged periods of time. They may experience the stress of dealing with irate patrons. The job can be particularly hectic around check-out time.

## Training, Other Qualifications, and Advancement

Employers usually select high school graduates who have some clerical aptitude as front office clerks. A knowledge of bookkeeping is helpful for work in a smaller hotel or on the night shift, because clerks often have a wider range of duties under these circumstances. Occasionally, employees in other hotel occupations, such as bellhops or elevator operators, may be promoted to front office jobs.

Newly hired workers usually begin as mail, information, or key clerks and receive their training on the job. The training period is usually brief and includes an explanation of the job's duties and information about the hotel, such as room locations and services offered. Once on the job, they receive help and supervision from the assistant manager or an experienced front office worker. Some clerks may need additional training in data processing or office machine operation because of the increased use of computerized front office systems.

A presentable appearance, a courteous and friendly manner, and a desire to help people are important traits for front office clerks. Another attribute helpful for work in larger hotels or resorts that cater to a diverse clientele is the ability to speak a foreign language.

In the past, front office personnel frequently have made the transition to managerial positions. Most hotels promote front office workers from within so that a key or mail clerk may be promoted to room clerk, then to assistant front office manager, and later to front office manager. Although a college background is generally not required for front office work, it is an asset for advancement to management. Clerks may also improve their opportunities for promotion by taking home or group study courses in hotel management such as those sponsored by the Educational Institute of the American Hotel and Motel Association.

## Job Outlook

Employment of front office clerks is expected to grow about as fast as the average for all occupations through the 1980's as additional hotels and motels are built and chain and franchise operations spread. Employment growth, however, will be limited by the use of computerized front office systems in most hotel and motel chains. Most job openings will result from the need to replace workers who transfer to other occupations, die, or retire. Seasonal job opportunities will be available in resort establishments that are open only part of the year.

## Earnings

Earnings of front office clerks depend on the location, size, and type of hotel in which they work. Large luxury hotels and those located in metropolitan and resort areas generally pay front office clerks more than less expensive hotels and those located in less populated areas. In 1980, clerks earned from $3.64 to $7.05 per hour, according to a survey of metropolitan areas. Those working the night shift generally receive additional compensation.

Most hotel employees receive 5 to 10 paid holidays a year, paid vacations, sick leave, life insurance, medical benefits, and pension plans. Some hotels offer bonuses, educational assistance, and other benefits to their employees.

Some clerks belong to the Hotel Employees and Restaurant Employees International Union.

## Related Occupations

Hotel front office clerks are often the first employees customers deal with, and it is important that they leave customers with a good impression. Other workers who are also responsible for giving a good first impression are receptionists, hosts and hostesses, and sales clerks.

## Sources of Additional Information

Information on careers and scholarships in the lodging industry may be obtained from:

The American Hotel and Motel Association, 888 7th Ave., New York, N.Y. 10019.

For a directory of colleges and other schools offering programs and courses in hospitality education, write to:

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Council on Hotel, Restaurant, and Institutional Education, Human Development Building, Room 118, University Park, Pa. 16802.

# Mail Carriers

(D.O.T. 230.363-010 and .367-010)

Mail carriers spend much of their time outdoors.

## Nature of the Work

Most mail carriers travel planned routes delivering and collecting mail. Carriers start work at the post office early in the morning, where they spend a few hours arranging their mail for delivery and taking care of other details.

A carrier may cover the route on foot, by vehicle, or by a combination of both. On foot, carriers carry a heavy load of mail in a satchel or push it in a cart. In some areas, a car or small truck is used to deliver mail. Residential carriers cover their routes only once a day, but some carriers assigned to a business district may make two trips a day. Deliveries are made house-to-house, to roadside mailboxes, and to large buildings, such as offices or apartments, which have all the mailboxes on the first floor.

Besides delivering and collecting mail, carriers collect money for postage-due and c.o.d. (cash on delivery) fees and obtain signed receipts for registered, certified, insured mail. If a customer is not home, the carrier leaves a notice that tells where special mail is being held.

After completing their routes, carriers return to the post office with mail gathered from street collection boxes and homes, and businesses. They turn in the mail receipts and money collected during the day and may separate letters and parcels for further processing by clerks.

Many city carriers have more specialized duties. Some deliver only parcel post while others collect mail from street boxes and receiving boxes in office buildings. In contrast, rural carriers provide a wide variety of postal services. In addition to delivering and picking up mail, they sell stamps and money orders and accept parcels, letters, and items to be registered, certified, or insured.

All carriers answer customers' questions about postal regulations and services and provide change-of-address cards and other postal forms when requested.

## Working Conditions

Most carriers begin work early in the morning, in some cases as early as 4 a.m. if they have routes in the business district. Carriers spend most of their time outdoors in all kinds of weather delivering mail. Even those who drive often must walk when making deliveries and must lift heavy sacks of parcel post when loading their vehicles.

The job, however, has its advantages. Carriers who begin work early in the morning are through by early afternoon. They are free to work at their own pace as long as they cover their routes within a certain period of time.

## Employment

The U.S. Postal Service employed nearly 250,000 mail carriers in 1980, three-quarters of them full time. Although about 50,000 were rural carriers, most worked in cities and suburban communities throughout the Nation.

## Training, Other Qualifications, and Advancement

Mail carriers must be U.S. citizens or have been granted permanent resident-alien status in the United States. They must be at least 18 years old (at least 16, if they have a high school diploma). Applicants must qualify on a written examination that measures their speed and accuracy at checking names and number and their abilities to memorize mail distribution systems.

Applicants must have a driver's license, a good driving record, and pass a road test. Before appointment, mail carriers must pass a physical examination and may be asked to show that they can lift and handle mail sacks weighing up to 70 pounds.

Applicants for mail carrier jobs should apply at a post office in the area where they wish to work. Applicants' names are listed in order of their examination scores. Five points are added to the score of an honorably discharged veteran, and ten points to the score of a veteran wounded in combat or disabled. When a vacancy occurs, the appointing officer chooses one of the top three applicants; the rest of the names remain on the list to be considered for future openings.

Mail carriers are classified as casual, part-time flexible, part-time regular, or full time. Casual workers are not career employees, but are hired to help deliver mail during peak mailing or vacation periods of the year. Part-time flexible carriers are career employees who do not have a regular work schedule, but replace absent workers and help with extra work as the need arises. Part-time flexible carriers usually work less than 40 hours per week. Part-time regulars have a set work schedule—for example, 4 hours a day. Full-time carriers usually work a 40-hour week over 5 or 6 days, but may work additional overtime hours when required.

New carriers are trained on the job. They may begin as part-time flexible city carriers and become regular or full-time carriers in order of seniority as vacancies occur. Carriers can look forward to obtaining preferred routes as their seniority increases, or higher level jobs such as carrier technician, or promotion to supervisory positions.

## Job Outlook

Employment of mail carriers is expected to decline through the 1980's due to decreases

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in the volume of mail. Continuing increases in use of the telephone rather than the written word, and electronic communications systems that transfer funds or transmit printed material instantaneously over telephone lines should result in less mail to be delivered. Growing business use of cheaper private delivery systems such as newspaper carriers, couriers, and parcel services is expected to divert additional mail. Possible cutbacks in delivery service from 6 days to 5 days per week could result in further loss of mail carrier jobs. Despite declining employment levels, thousands of job openings will result annually from the need to replace experienced carriers who retire, die, or transfer to other occupations. Openings will be concentrated in areas with rapid population growth.

Although the volume of mail to be delivered rises and falls with the level of business activity, as well as with the season of the year, full-time mail carriers have never been laid off. When mail volume is high, full-time carriers work overtime, part-time carriers work additional hours, and casual carriers may be hired. When mail volume is low, overtime is curtailed, part-time carriers work fewer hours, and casual workers discharged. The projected long-term employment decline probably will not cause layoffs of permanent workers but will be achieved by elimination of some positions vacated by workers who leave voluntarily, as was the case during the 1970's.

## Earnings

In late 1980, experienced full-time city delivery mail carriers earned an average salary of $19,275 a year, about one and one-half times as much as average earnings for all nonsupervisory workers in private industry, except farming. Full-time carriers started at a rate of $18,282 a year and could rise to a maximum of $20,944 after 8 years. They also received 10-percent additional pay for work between 6 p.m. and 6 a.m. Part-time flexible carriers began at $9.05 an hour in late 1980, with periodic increases up to $10.38 an hour after 8 years.

Rural delivery carriers had average base salaries of $20,121 in late 1980. Their earnings are determined through an evaluation of the amount of work required to service their routes. Carriers with heavier workloads generally earned more than those with lighter workloads. Rural carriers also received a maintenance allowance when required to use their own vehicles.

## Related Occupations

Postal clerks and mailhandlers play an important role in moving the Nation's mail, and their work and qualifications are closely related to those of mail carriers. Related delivery occupations include messengers, merchandise deliverers, delivery-route truckdrivers, newspaper delivery drivers, and newspaper carriers.

## Sources of Additional Information

Local post offices and State employment service offices can supply details about entrance examinations and specific employment opportunities for mail carriers.

# Postal Clerks

(D.O.T. 243.367-014)

## Nature of the Work

Most people are familiar with the post office window clerk behind the counter who sells stamps and accepts parcel post. However, most postal clerks are distribution clerks who sort incoming and outgoing mail in workrooms out of public view.

Postal clerks work at local post offices or at large central mail processing facilities. Those at local post offices sort local mail for delivery to individual customers. Incoming mail collected from local collection boxes is forwarded to the nearest mail processing center. There, clerks sort and prepare the mail for delivery.

About 300 mail processing centers throughout the country service post offices in surrounding areas. There, mailhandlers unload the sacks of incoming mail and separate it into groups of letters, parcel post, magazines, and newspapers. They feed letters through stamp-canceling machines, then take the mail to other workrooms to be sorted by postal clerks according to destination. There, clerks operating electronic letter sorting machines push keys corresponding to the ZIP code of the local post office to which each letter will be delivered; the machine drops letters into proper slots. Other clerks sort odd-sized letters, magazines, and newspapers by hand. Finally, the mail is sent to local post offices for further sorting according to delivery route.

In addition to selling stamps and money orders, clerks at post office windows weigh packages to determine postage and check to see if their condition is satisfactory for mailing. Clerks also register, certify, and insure mail and answer questions about postage rates, mailing restrictions, and other postal matters. Occasionally they may help a customer file a claim for a damaged package.

## Working Conditions

Working conditions of clerks differ according to work assignments and type of labor-saving machinery available. In small post offices, clerks may use a hand truck to move heavy mail sacks from one part of the building to another and sort mail by hand. In large post offices and mail processing centers, chutes and conveyors move the mail, and much of the sorting is done with machines. When not operating a letter sorting machine, clerks usually are on their feet, reaching for sacks and trays of mail and placing packages and bundles into sacks and trays.

Distribution clerks may become bored with the routine of sorting mail unless they try to improve their speed and accuracy. They also may have to work at night or on weekends, because most large post offices process mail around the clock.

A window clerk, on the other hand, has a greater variety of duties, frequent contact with the public, and a generally less strenuous job. Window clerks rarely have to work at night.

## Employment

Two out of every five Postal Service employees were postal clerks in 1980. The majority of the 265,000 postal clerks work at mail processing centers, although many still sort mail and provide window services at local post offices throughout the country.

Window clerks determine postage and sell stamps.

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Three out of four clerks worked full time; most of the others were part-time employees.

## Training, Other Qualifications, and Advancement

Postal clerks must be U.S. citizens or have been granted permanent resident-alien status in the United States. They must be at least 18 years old (at least 16 if they have a high school diploma). They must qualify on a written examination that measures their speed and accuracy at checking names and numbers and their abilities to memorize mail distribution systems. Applicants must also pass a physical examination and may be asked to show that they can lift and handle mail sacks weighing up to 70 pounds. Applicants who are to work with an electronic sorting machine must pass a special examination which includes a machine aptitude test.

Applicants should apply at the post office or mail processing center where they wish to work. Applicants' names are listed in the order of their scores. Five points are added to the score of an honorably discharged veteran, and 10 points to the score of a veteran wounded in combat or disabled. When a vacancy occurs, the appointing officer chooses one of the top three applicants; the rest of the names remain on the list for future appointments.

New clerks are trained on the job. Most clerks begin with simple tasks to learn regional groupings of States, cities, and ZIP codes. To help clerks learn these groups, many post offices offer classroom instruction.

A good memory, good coordination, and the ability to read rapidly and accurately are important. Distribution clerks work closely with other clerks, frequently under the tension and strain of meeting deadlines. Window clerks must be courteous and tactful when dealing with the public, especially when answering questions or receiving complaints.

Postal clerks are classified as casual, part-time flexible, part-time regular, or full time. Casual workers are not career employees, but are hired to help process mail during peak mailing or vacation periods of the year. Part-time flexible clerks are career employees who do not have a regular work schedule but replace absent workers and help with extra work as the need arises. Part-time flexible clerks usually work less than 40 hours per week. Part-time regulars have a set work schedule—for example, 4 hours a day. Full-time clerks usually work a 40-hour week over 5 days.

Most clerks begin as part-time flexible employees and become full-time workers in order of seniority as vacancies occur. Full-time clerks may bid for preferred assignments such as the day shift, a window job, or a higher level nonsupervisory position as expediter or window service technician. Clerks also may advance to supervisory positions.

## Job Outlook

Employment of postal clerks is expected to decline through the 1980's as more efficient automated sorting machines are installed. The quantity of mail handled by the postal service is expected to decline because of rising postal rates, greater use of telephones, and new ways of distributing advertising circulars. In addition, growing quantities of mail will be transmitted electronically, and will require little or no sorting. Nevertheless, many job openings will result from the need to replace clerks who transfer to other occupations, retire, or die. Openings will be concentrated in areas with rapid population growth.

Although the volume of mail to be processed rises and falls with the level of business activity, as well as with the season of the year, full-time postal clerks have never been laid off. When mail volume is high, full-time clerks work overtime, part-time clerks work additional hours, and casual clerks may be hired. When volume is low, overtime is curtailed, part-time clerks work fewer hours or may be laid off, and casual workers are discharged. The projected long-term employment decline probably will not cause layoffs of permanent workers, but will be achieved by elimination of some positions vacated by workers who leave voluntarily, as was the case during the 1970's.

## Earnings

In 1980, experienced full-time postal clerks averaged $19,222 a year, about one and one-half times the average for all nonsupervisory workers in private industry, except farming.

Full-time postal clerks started at a base rate of $18,282 a year and increased to a maximum of $20,944 after 8 years. Clerks working part-time flexible schedules started at $9.05 an hour and could advance to $10.38 an hour after 8 years. Clerks who work night shifts receive 10-percent additional pay. Full-time postal employees have more job security than workers in most other industries.

## Related Occupations

Mail carriers and mailhandlers play an important role in moving the Nation's mail, and their work and qualifications are closely related to that of postal clerks. Postal clerks sort mail by hand or by keyboarding addresses into electronic letter-sorting machines. Other information processing occupations that have related duties include mail clerks, file clerks, routing clerks, sorters, medical record clerks, clerk-typists, cashiers, keypunch operators, and ticket sellers.

## Sources of Additional Information

Local post offices and State employment service offices can supply details about entrance examinations and specific employment opportunities for postal clerks.

# Receptionists

(D.O.T. 237.367-038)

## Nature of the Work

All organizations want to make a good first impression on the public. This is an important part of the job of the receptionist, who generally is the first person a caller sees.

Receptionists greet customers and other visitors, determine their needs, and refer callers to the person who can help them. Receptionists' day-to-day duties vary a great deal, depending on where they work. Those in hospitals and doctors' offices, for example, may obtain personal and financial information and then direct patients to the proper waiting rooms. In beauty shops, receptionists arrange appointments and may show customers to the operator's booth. In factories or large business firms, they provide callers with identification cards and arrange for escorts to take them to the proper office.

Many receptionists keep records of callers, the times at which they called, and the persons to whom they were referred. When they are not busy with callers, receptionists may type, file, or operate a switchboard. Some receptionists open and sort mail and collect and distribute messages. Still others prepare travel vouchers and do simple bookkeeping.

## Working Conditions

Because receptionists greet customers and visitors, they usually work in areas that are carefully designed and furnished to make a good impression. Working conditions usually are pleasant; offices are clean, well lighted, and relatively quiet.

Although most have regular hours, receptionists in hospitals and some professional offices may work weekends or in the evenings.

## Employment

About 635,000 persons worked as receptionists in 1980. Although receptionists work in almost every kind of organization, about one-third work for doctors, dentists, hospitals, nursing homes, and other health service providers. Large numbers of receptionists also work in factories, wholesale and retail stores, real estate offices, and firms providing a wide range of business and personal services.

## Training, Other Qualifications, and Advancement

This occupation offers good opportunities for persons without prior work experience. Employers usually require that receptionists have a high school diploma.

Personal characteristics are very important in this occupation. A receptionist should like meeting new people and have a desire to be helpful and informative. A neat appearance, a pleasant voice, and an even disposition also are important.

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Receptionists help build a positive image for the firm.

Because receptionists do not work under close supervision, common sense and a thorough understanding of how the business is organized help them handle various situations that arise.

Promotion opportunities for receptionists are limited, especially in small offices. In large workplaces, however, a receptionist who has clerical skills may advance to a better paying job as a secretary, administrative assistant, or bookkeeper.

English, typing, shorthand, business arithmetic, basic accounting and bookkeeping, office procedures, and other useful subjects for receptionists are taught in high schools throughout the country. College or business school training also can be helpful in advancing to better paying office jobs. Many companies have their own training programs so that the skills needed for advancement can be learned on the job.

## Job Outlook

Employment of receptionists is expected to grow faster than the average for all occupations through the 1980's. Thousands of openings will result each year as businesses expand and many experienced receptionists transfer to other jobs, stop working for personal reasons, retire, or die. The number of replacements will be quite large because the occupation is large and turnover is high.

Employment of receptionists is expected to grow more rapidly than employment of all clerical workers combined. This is largely because so many receptionists work for firms providing business and professional services—sectors of the economy that are expected to continue to show strong growth—particularly doctors' and dentists' offices, hospitals, and other health service facilities. In addition, more and more firms are coming to recognize the importance of the receptionist in promoting good public relations. Further, because the receptionist's work is of a person-to-person nature, it is unlikely to be affected by office automation.

Since many receptionists also perform secretarial duties, persons with good typing, stenographic, and other skills should have the best job prospects.

## Earnings

Full-time switchboard operator-receptionists working in urban areas averaged $187 a week in 1980, compared with an average of $235 a week for all nonsupervisory and production workers in private industry, except farming. Receptionists working in the West had average weekly earnings of $198. Those in the South averaged about $177 a week. In the Federal Government, beginning information receptionists with a high school diploma or 6 months of work experience earned about $8,300 a year in early 1981. Receptionists working for the Federal Government averaged around $11,500 a year in 1980.

## Related Occupations

A number of other workers deal with the public, receive and provide information, or direct people to others who can assist them. Among these are information clerks, information and referral aides, and customer service representatives.

## Sources of Additional Information

See the introduction to this section on administrative support occupations, including clerical, for sources of additional information.

# Secretaries and Stenographers

(D.O.T. 201.162-010, .362-010, -014, -018, -022, and -030, 202.362-010, -014, -018, and -022)

## Nature of the Work

The efficiency of any organization depends in large part upon *secretaries* and *stenographers*, who are at the center of communications within the firm. They process and transmit information to the staff and to other organizations.

Secretaries perform a variety of administrative and clerical duties so that their employers can work on other matters. They schedule appointments, give information to callers, organize and maintain files, fill out forms, and take and transcribe dictation. The amount of time secretaries spend on these and other duties—including typing—depends on the way office work is handled within the organization.

In offices that have word processing centers, *administrative secretaries* handle everything except dictation and typing. Their duties range from filing, routing mail, and answering telephones to more complex work such as answering letters, doing research, and preparing statistical reports. Administrative secretaries often work in clusters of three or four so that they can help each other. Because they are released from dictation and typing, they can serve several members of the professional staff.

Some secretaries do highly specialized work for which training is available in business schools and colleges as well as community colleges. *Legal secretaries* (D.O.T. 201.362-010) prepare legal papers and correspondence such as summonses, complaints, motions, and subpoenas. They may also review law journals and assist in other ways with legal research. *Medical secretaries* (D.O.T. 201.362-014) transcribe dictation, prepare correspondence, and assist physicians or medical scientists with reports, speeches, articles, and conference proceedings. They need to know medical terminology and be familiar with hospital or laboratory proce-

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dures. *Technical secretaries* assist engineers or scientists. In addition to the usual secretarial duties, they may prepare much of the correspondence, maintain the technical library, and gather and edit materials for scientific papers.

Another specialized secretary is the *social secretary* (D.O.T. 201.162-010), who arranges social functions, answers personal correspondence, and keeps the employer informed about all social activities. *Membership secretaries* (D.O.T. 201.362-018) compile and maintain membership lists, record the receipt of dues and contributions, and give out information to members of organizations and associations. They may have such other duties as sending out newsletters and promotional materials. *School secretaries* (D.O.T. 201.362-022) handle secretarial duties in elementary and secondary schools; they may take care of correspondence, prepare bulletins and reports, keep track of money for school supplies and student activities, and maintain a calendar of school events.

*Stenographers* (D.O.T. 202.362-014) and *stenotype operators* (D.O.T. 202.362-022) take dictation and then transcribe their notes on a typewriter. They may either take shorthand or use a stenotype machine that prints symbols as certain keys are pressed. *General stenographers*, including most beginners, take routine dictation and do other office tasks such as typing, filing, answering telephones, and operating office machines. Experienced and highly skilled stenographers take difficult dictation and do more responsible clerical work. They may sit in on staff meetings and later give a summary report or a word-for-word record of the proceedings. They also supervise other stenographers, typists, and clerical workers. *Technical stenographers* must know the terms used in a particular profession. They include medical, legal, and engineering or scientific stenographers. Some experienced stenographers take dictation in foreign languages; others work as public stenographers serving traveling business people and others.

*Shorthand reporters* (D.O.T. 202.362-010) are specialized stenographers who record all statements made in a proceeding. Shorthand reporters often work as *court reporters*. They take down all statements made at legal proceedings and present their record as the official transcript. Many other shorthand reporters work as *freelance reporters* who record out-of-court testimony for attorneys, proceedings of meetings and conventions, and other private activities. Still others record the proceedings in the U.S. Congress, in State legislatures, and in State and Federal agencies. Many reporters dictate notes on magnetic tapes that a typist can transcribe later. Many other reporters transcribe their notes with the help of note readers, persons skilled in reading back shorthand notes. A growing number of reporters use Computer Aided Transcription (CAT), a system in which a computer directly translates the reporter's shorthand notes into English. Because the reporter's transcript is the official record of a proceeding, accuracy is vitally important.

Secretaries are in great demand.

*Print shop stenographers* (D.O.T. 202.362-018) take dictation and use typewriters to transcribe the dictated material and to prepare metal printing plates to be used by addressing machines.

## Working Conditions

Secretaries usually work in offices that are clean, well lighted, and free from high noise levels except during peak typing periods. Their jobs often involve sitting for long periods, and typing often requires working from materials that are difficult to read. Executive secretaries, who perform a number of duties, have the variety in their jobs that many people prefer.

Secretaries and stenographers generally work a standard 40-hour week. In some cities, especially in the Northeast, the scheduled workweek is 37 hours or less.

Office work lends itself to alternative or flexible working arrangements, and many secretaries hold part-time or temporary jobs. Some participate in job-sharing arrangements, in which two people divide responsibility for a single job. A few employers are experimenting with "home based" offices; sophisticated equipment installed in secretaries' homes enables them to transcribe material at home and, almost instantly, produce printed copy in an office miles away.

## Employment

Nearly 2.5 million secretaries were employed in 1980. About 280,000 persons worked as stenographers.

Secretaries are employed in organizations

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of every description. They work for businesses that engage in manufacturing, mining, construction, wholesale and retail trade, transportation, and communications. Banks, insurance companies, investment firms, and real estate firms are important employers, too. Secretaries work in Federal, State, and local government agencies. Half of them, however, are employed by organizations that provide services to the public: Educational institutions, hospitals and other health facilities, law firms, membership organizations, and companies that provide business services. Among the latter are employment agencies that provide "office temporaries" and word processing service bureaus.

Stenographers, too, are employed throughout the economy. Two out of five, however, work for government agencies, a reflection of the large number of shorthand reporters working in courts, legislatures, and agencies in the executive branch.

## Training, Other Qualifications, and Advancement

A high school diploma generally is required for a job as a secretary or stenographer. Most employers prefer applicants who have had secretarial training at a college or business school. Courses vary from a few months' instruction in office practices, shorthand, and typing to 1- to 2-year programs that teach a broad range of secretarial skills. Shorthand reporters generally must complete a 2-year course in a shorthand reporting school.

While specific hiring requirements for secretaries vary a great deal, many firms in major metropolitan areas require a typing speed of 65 words a minute and shorthand of about 90 words a minute. Knowledge of shorthand is a "definite plus" in landing a high-paying secretarial job, and many employers insist on it. Some require word processing skills as well.

In addition to a solid grounding in secretarial skills, employers look for a good command of the English language and an aptitude for numbers. Some firms look for individuals with excellent interpersonal skills, since secretaries must be tactful in their dealings with many different people. Discretion, judgment, organizational ability, and initiative are important for the more responsible secretarial positions.

Continuing changes in the office environment, many made possible by the computer, have increased the demand for secretaries and stenographers who are adaptable and versatile. Workers must be prepared to be retrained whenever an employer introduces new equipment. Secretaries may have to spend days or weeks in classes to learn to operate word processing equipment, information storage systems, and other automated equipment. The frequency with which office equipment is changed or updated makes retraining and continuing education an integral part of the job, and employers seek workers who understand and accept the inevitability of change.

Employers usually have no preferences among the many different shorthand methods. For court reporters, however, the preference is for stenotype (machine shorthand), not only because reporters can write faster using stenotype, but also because they can feed stenotype notes to a computer for high-speed transcription. The most important factors in hiring and promotion are speed and accuracy. To qualify for jobs in the Federal Government, stenographers must be able to take dictation at a minimum of 80 words per minute and type at least 40 words per minute. Workers must achieve higher rates to advance to more responsible positions. In private firms the requirements vary, but applicants with the best speed and accuracy will receive first consideration in hiring. Many shorthand reporting jobs require more than 225 words of dictation per minute; shorthand reporters in the Federal Government generally must take at least 175 words a minute.

Several States require each court reporter to be a Certified Shorthand Reporter (CSR). A certification test is administered by a board of examiners in each of the States that have CSR laws. The National Shorthand Reporters Association confers the designation Registered Professional Reporter (RPR) upon those who pass a two-part examination and participate in continuing education programs. The RPR designation is recognized as the mark of excellence in the profession.

Opportunities for advancement for secretaries and stenographers include promotion to successively more responsible positions within the occupation—or a career change. As secretaries gain experience, they can qualify for the designation Certified Professional Secretary (CPS) by passing a series of exams given by the Institute of Certifying Secretaries, a department of Professional Secretaries International. This designation is recognized by a growing number of employers as the mark of achievement in the secretarial field. Stenographers may advance to secretarial jobs; those who acquire the necessary speed through additional training can become shorthand reporters.

Qualified secretaries who broaden their knowledge of their company's operations may be promoted to positions such as administrative assistant, clerical or secretarial supervisor, and office manager. By taking college courses or completing a degree program in a field such as business, marketing, accounting, or personnel administration, secretaries may progress into entry level management positions.

Secretaries and stenographers with word processing experience can advance to jobs as word processing trainers, supervisors, or managers within their own firms or in a secretarial or word processing service bureau. They also can get jobs with manufacturers of word processing and other office equipment in positions such as instructor or sales representative.

## Job Outlook

Employment of secretaries is expected to increase faster than the average for all occupations through the 1980's as the expansion of business and government continues to create more paperwork. Many jobs will be available every year due to increased demand for secretaries and the need to replace those who transfer to other jobs, retire, or die.

Demand for secretaries will rise as new organizations are established and existing ones expand. Hospitals, nursing homes, and university medical centers; insurance companies offering new forms of protection; and banks providing financial services to a growing and increasingly affluent population are just a few of the organizations that will need secretaries in the years ahead.

Neither office automation nor economic downturns are expected to have an adverse impact on employment of secretaries. Technological developments in office equipment are certain to continue, and they will bring about further changes in the secretary's work environment. However, automated office equipment cannot substitute for the personal qualities that are essential to the job. Fluctuations in the level of business activity have little effect, overall, on employment of clerical workers. Even during slack periods, companies must process paperwork. And when business failures lead to layoffs, secretaries and stenographers normally find other jobs soon.

Skilled secretaries are in great demand, and this situation is expected to continue. Job prospects are especially favorable for secretaries with excellent typing and shorthand skills, word processing experience, organizational ability, judgment, and initiative.

Opportunities are excellent for temporary or part-time work in the secretarial field. Employers are increasingly receptive to such arrangements because of the shortage of qualified secretaries in many parts of the country.

Employment of stenographers is expected to continue the decline of recent years. The widespread use of dictation machines has greatly reduced the need for office stenographers, and the traditional "steno pool" is becoming a thing of the past. In contrast, demand for skilled shorthand reporters should remain strong as State and Federal court systems expand to handle the rising number of criminal court cases and civil lawsuits. Competition for entry level jobs as shorthand reporters is increasing, as more students enter the field. Opportunities will be best for those who have earned certification by the National Shorthand Reporters Association.

## Earnings

Secretaries and stenographers' salaries vary a great deal, usually reflecting differences in skill, experience, and level of responsibility.

Salaries in different parts of the country also vary; earnings generally are lowest in southern cities and highest in northern and western urban areas. In 1980, for example, secretaries averaged $13,364 a year in the

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Northeast, $14,066 in the North Central region, $14,586 in the West, and $12,818 in the South.

Stenographers in private industry averaged $13,191 a year in 1981, according to a Bureau of Labor Statistics survey, while experienced stenographers averaged $15,727. According to the same survey, secretaries to supervisors in small offices averaged $12,947 a year in 1981. Secretaries to officers in small companies had average yearly salaries of $13,769; those working for middle management in large companies averaged $15,576. Secretaries holding greater responsibilities, such as executive secretaries to corporate officers, earned average salaries of $16,872 per year.

According to a survey by the American Management Associations, in 1980 office workers received the following average annual salaries:

| | |
|---|---|
| Secretary | $11,856 |
| Bilingual secretary | 12,844 |
| Legal secretary | 13,572 |
| Executive secretary | 13,416 |
| Secretary to staff vice president | 14,716 |
| Secretary to executive vice president | 16,952 |
| Secretary to chief executive officer | 19,812 |
| Junior stenographer | 9,932 |
| Senior stenographer | 11,492 |
| Legal stenographer | 12,584 |

Beginning clerk-stenographers in the Federal Government earned from $9,766 to $12,266 a year in early 1981 depending on education, training, and experience. Shorthand reporters generally earn higher salaries than stenographic office workers. In 1980, according to a survey made by the National Shorthand Reporters Association, beginning reporters employed by courts earned average salaries of $16,800 a year, while beginning reporters who were self-employed averaged $14,800 a year. Earnings vary, depending on speed, education, experience, and geographical location (earnings are generally higher in large cities than in rural areas).

Starting salaries for secretaries in the Federal Government ranged from $9,776 to $15,193 a year. Clerk-stenographers and secretaries employed by the Federal Government in 1980 had average annual salaries of about $12,100 and $14,700, respectively.

Employers usually pay secretaries and stenographers who have word processing experience higher salaries than those without such experience.

Most secretaries and stenographers in large cities receive 7 paid holidays or more a year and a 2-week vacation after working 1 year. With added years of service, vacations may range to 4 weeks or more. Group life and health insurance, pension plans and other fringe benefits often are provided.

## Related Occupations

A number of other workers type, record information, and process paperwork. Among these are bookkeepers, receptionists, office managers, personnel clerks, typists, administrative assistants, medical assistants, and legal assistants.

## Sources of Additional Information

For career information, write to:

Professional Secretaries International, 2440 Pershing Rd., Suite G10, Kansas City, Mo. 64108.

Information on careers in secretarial work and a directory of business schools and colleges are available from:

Association of Independent Colleges and Schools, 1730 M St. NW., Suite 600, Washington, D.C. 20036.

High school students interested in careers as legal secretaries may request the pamphlet *So You Want To Be A Legal Secretary*. Write to:

National Association of Legal Secretaries (International), 3005 East Skelly Dr., Tulsa, Okla. 74105.

For information about shorthand reporting, contact:

National Shorthand Reporters Association, 118 Park St. SE., Vienna, Va. 22180.

State employment offices can provide information about job openings for secretaries and stenographers locally and nationwide.

# Teacher Aides

(D.O.T. 099.327-010, 219.467-010 and 249.367-074)

## Nature of the Work

Teacher aides handle routine classroom tasks so that teachers can spend more time teaching. They work with students in the classroom, and assist with nonteaching activities such as recording grades or setting up equipment.

Aides' responsibilities vary greatly by school district. In some schools, aides work directly in the instruction of children. Under the supervision and guidance of the teacher, they help students individually or in small groups. An aide might listen to one student read, help another find information for a report, or watch a third demonstrate a skill. Sometimes, the teacher has an aide take charge of a special project for a group of students, such as preparing equipment for a science demonstration.

In other schools, teacher aides primarily handle routine nonteaching tasks. They may grade tests and papers, check homework, and keep health and attendance records. Secretarial duties such as typing, filing, and duplicating materials for the teacher's use may be part of the aide's job. Sometimes, teacher aides are expected to stock supplies, operate audiovisual equipment, and keep classroom equipment in order. They also may supervise students during lunch and recreation periods and school bus loading.

## Working Conditions

Teacher aides may work full time or part time. They may work inside or outdoors and may spend much of their time standing, walking, or kneeling. Working closely with the students can be both physically and emotionally tiring.

## Employment

About 415,000 persons worked as teacher aides in 1980. Although they are employed in both elementary and secondary schools, aides are concentrated in the early grades. A substantial number have been hired in recent years to assist special education teachers who work with physically, mentally, or emotionally handicapped children. Many aides work in large city schools or in suburban schools bordering major metropolitan areas. However, aides are also employed in small schools, notably in rural areas that find it difficult to retain enough qualified teachers.

Many school systems rely on the services of volunteers who are willing to work as teacher aides. While volunteers generally do not receive any payment for their services, volunteer experience may make it easier for a person to obtain a paid position as a teacher aide later on.

## Training, Other Qualifications, and Advancement

Educational requirements for teacher aides vary widely. Some schools expect aides to have a high school diploma; others do not insist on it. Still other schools require aides to have some college training. Schools that delegate a significant amount of classroom responsibility to aides usually require more training than those which primarily assign aides to clerical or monitor jobs.

Teacher aides generally receive their training for classroom work on the job. However, a number of 2-year and community colleges offer associate degree programs that prepare graduates to work directly in the classroom as teacher aides.

Newly hired teacher aides undergo a period of orientation and training in which they learn how to help the classroom teacher work with students. Aides are taught how to operate audiovisual equipment, administer first aid, and keep records. They learn to make charts and other instructional materials and also learn to prepare bulletin boards and work with other art media. In addition, they are made familiar with the organization and operation of a school, and they learn about the methods used to teach handwriting, reading, math, science, and other school subjects.

Personal traits are among the most important qualifying factors for the teacher aide's job. Aides should be able to work with children and to handle classroom situations with fairness and patience. Preference may be given in hiring to those with previous experience working with children. Aides also must demonstrate initiative and a willingness to follow the classroom teacher's directions. They must have basic speech and writing skills and be able to communicate effectively with students

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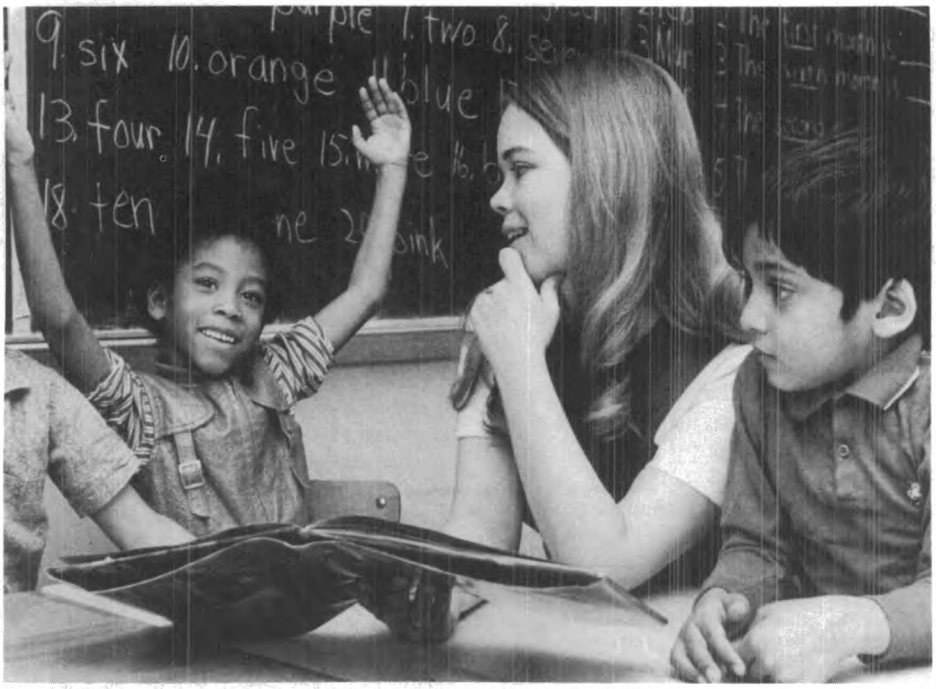


Teacher aides encourage students to participate in class activities.

and teachers. Clerical skills may be necessary also.

Thirteen States have certification procedures for teacher aides. To qualify, a teacher aide may need a high school diploma or general equivalency degree (G.E.D.), or even some college. Kansas, Louisiana, and Wisconsin grant permits for paraprofessionals in the field of special education.

Many schools have additional regulations regarding the hiring of teacher aides. For example, applicants for positions which are funded through special programs such as CETA may be required to have a family income below a certain level. Some school districts give preference in hiring to persons residing within the school district. Health regulations may require that teacher aides pass a physical examination.

The local superintendent of schools and the State department of education can provide detailed information on employment requirements.

Advancement for teacher aides, usually in the form of higher earnings or increased responsibility, comes primarily with experience. Some school districts provide release time so that aides may take courses. In this way, aides eventually can earn bachelor's degrees and become certified teachers.

## Job Outlook

Employment of teacher aides is expected to increase about as fast as the average for all occupations through the 1980's. The projected increase in elementary school enrollments beginning in the mid-1980's is expected to heighten demand for aides during the latter half of the decade. Enrollment growth will not occur at the same rate in all parts of the country, however. Largely because of migration to the South and West, enrollment increases are expected to be greater in those regions than in the Northeast and North Central States. The U.S. Bureau of the Census projects that between 1980 and 1990, fully three-fourths of the entire increase in the number of American children aged 5-14 will occur in Southern and Western States.

Teacher aide employment is highly sensitive to changes in State and local expenditures for education. Pressure from taxpayers to limit tax and spending increases are likely to continue through the 1980's, but budget pressures on public education are far greater in some States and localities than in others. Moreover, school systems respond to budget constraints in different ways. Severe curtailment of educational spending would undoubtedly result in staff cutbacks in some school districts, while other districts might respond by hiring more teacher aides and fewer teachers. A number of teacher aide positions are financed through a variety of Federal programs; reductions in Federal funding would affect some districts more than others.

Because of relatively high turnover in the occupation, most openings for teacher aides during the 1980's are expected to occur as a result of the need to replace workers who transfer to other occupations, retire, or die.

## Earnings

In 1980-81, teacher aides involved in teaching activities earned an average of about $4.50 an hour; those performing only nonteaching activities averaged about $4.30 an hour. Earnings varied by region and also by the work experience and academic qualifications of the aide. Many aides are covered by collective bargaining agreements and have health and pension benefits similar to those of the teachers in their schools.

## Related Occupations

The educational support activities that teacher aides perform demand organizational skills, cooperativeness, recordkeeping abilities, and a talent for getting along with people. Other occupations requiring some or all of these skills include childcare attendants, career guidance technicians, home health aides, library attendants, medical record technicians, nurse aides, receptionists, record custodians, and retail sales clerks.

## Sources of Additional Information

Information on a wide range of education-related issues, including teacher aide unionization, can be obtained from:

American Federation of Teachers, 11 Dupont Circle, Washington, D.C. 20036.

General information on education-related issues is also available from local affiliates of the National Education Association, or by writing to:

National Education Association, 1201 16th St. NW., Washington, D.C. 20036.

# Telephone Operators

(D.O.T. 235.222-010, .462-010, .562-014, .662-014, -018, -022, -026, and 239.367-026)

## Nature of the Work

Although millions of telephone numbers are dialed directly each day, making a call sometimes requires the assistance of a telephone operator. An operator may be needed because a caller wants to reverse long-distance charges, find out a telephone number in another city, or know the cost of a call. Operators also help contact the police or fire departments in an emergency or arrange conference calls for business executives.

Providing these services are two groups of telephone operators. The operators who work in telephone company central offices probably are the most familiar. But many businesses and large organizations receive so many calls that they employ operators to run their private branch exchange (PBX) switchboards. Sometimes operators place calls by inserting and removing plugs that make switchboard connections and by listening and speaking into their headsets. However, many switchboards, especially those in telephone company central offices, are operated by pushbuttons.

Telephone company operators known as *central office operators* help customers with calls that require assistance, such as person-to-person, coin-station and collect calls. They obtain the information needed to complete the call and record the details for billing. Those who make long distance connections are called *long distance operators*. *Directory assistance operators* look up and provide telephone numbers.

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*PBX operators*, sometimes called PBX attendants, run switchboards for business firms and other establishments. They connect interoffice or house calls, answer and relay outside calls, assist company employees in making outgoing calls, supply information to callers, and record charges. In small establishments, PBX operators may do other office work such as typing or sorting mail. Many act as receptionists or information clerks.

Telephone company operators with the appropriate qualifications can become *private-branch-exchange service advisors*, sometimes called customer instructors. Their job is to conduct training classes in the operation of switchboard and teletype equipment on behalf of the telephone company either at the company's training school or on the customer's premises. Qualified operators also can become *service observers*. Service observers monitor the telephone conversations between operators and customers to observe the operator's behavior, technical accuracy, and adherence to company policies.

*Police district switchboard operators* run switchboards to receive and transmit police communications, such as calls from citizens for assistance or police officers in the field. *Communication-center operators* handle airport authority communication systems and monitor electronic equipment alarms. For example, they use the public address system to page passengers or visitors. *Telephone-answering-service operators* manage switchboards to provide answering service for clients.

## Working Conditions

Telephone company operators generally work 37 1/2 hours a week. The scheduled hours of PBX operators generally are the same as those of other clerical workers in the firm. In telephone companies, however, and in hotels, hospitals, and other places where telephone service is needed on a 24-hour basis, operators work on shifts, on holidays, and on weekends. Some operators work split shifts—that is, they are on duty during the peak calling periods in the late morning and early evening and have time off in between. Telephone companies normally assign shifts by seniority. These operators, like all telephone company employees, are subject to 24-hour call. In general, though, they work overtime only during emergencies. Because an operator cannot make up time missed, telephone companies strictly regulate attendance and punctuality.

Operators usually work in pleasant, well lighted, air-conditioned surroundings. The job of a telephone operator requires little physical exertion; however, during peak calling periods, the pace at the switchboard may be hectic. Often operators are unable to leave their seats during these periods. An operator's work generally is quite repetitive and, in the telephone companies, it is closely supervised.

In most telephone company central offices, telephone operators use computerized equipment.

## Employment

About 340,000 telephone operators were employed in 1980. More than one-half worked as PBX operators in manufacturing plants, hospitals, department stores, or businesses. The remainder worked in telephone companies. Roughly one-fourth of all operators work part time, although relatively few of those employed by telephone companies do so.

Employment is concentrated in heavily populated areas, and large numbers of telephone operators work in the New York City, Chicago, and Los Angeles metropolitan areas. An increasing number work in rapidly growing areas such as Houston and Denver.

## Training, Other Qualifications, and Advancement

Persons interested in becoming telephone operators should like to serve the public, be pleasant, courteous, and patient, and not mind sitting for long periods of time. A clear, pleasing voice and good hearing are important. In addition to being good listeners, prospective operators should have good reading, spelling, and arithmetic ability. Good eye-hand coordination and manual dexterity are useful. Many telephone companies and business firms require applicants, including operators, to pass a physical examination. Some employers require a high school diploma for operator jobs. High school courses in speech, office practices, and business math provide a helpful background for persons interested in this occupation.

New operators are taught how to use the equipment and keep records of calls. Once they have learned the procedure, they put through practice calls. In the telephone companies, classroom instruction usually lasts up to 3 weeks and is followed by on-the-job training. Classroom instruction covers the time zones and geography so that central office operators understand rates and know where major cities are located. Tapes are used to familiarize trainees with the dial tone, busy signal, and other telephone sounds and to improve diction and courtesy by giving them an opportunity to hear their own voices. Training is tailored to the knowledge requirements of the section in which the employee is going to work. Close supervision continues after training is completed.

PBX operators who handle routine calls usually have a somewhat shorter training period than telephone company operators. In large businesses, an instructor from the local telephone company may train new employees.

Telephone company operators may be promoted, after 1 or 2 years of experience, to junior service assistant or service observer, assisting the supervisor by monitoring telephone conversations. Promotion to supervisor also is possible. Some operators advance to other clerical jobs or to telephone craft jobs such as installer and repairer. Large firms may advance PBX operators to more responsible clerical positions; however, many small businesses have limited advancement opportunities.

## Job Outlook

Because employment of telephone and PBX operators is expected to grow more slowly than the average through the 1980's, most openings will occur because of the need to replace experienced operators who stop working or transfer to other occupations.

Employment of telephone company operators, which has been declining for the past 25 years, is likely to level off during the 1980's as reduced labor requirements resulting from

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technological innovation are offset by increased service demand. Technological changes that raise productivity—thus reducing the need for operators—are virtually certain to continue. At the same time, the outlook is for continued strong growth in both residential and business demand for telephone services. Moreover, new markets are expected to develop, including electronic funds transfer systems and home data processing. Provided this increased service demand offsets the employment impact of new technologies, little change in the number of telephone operators will occur.

Technological innovations have taken place in a number of areas. Many telephone companies have installed electronic switching systems in their central offices, thus reducing the need for manual switching. Traffic service position systems have been added; these automatically feed data about each telephone connection, such as the length and cost of the call, into a computer that processes the billing statements. Formerly an operator tabulated and then transferred this information to the statement. It is now possible in many places to direct dial numbers in other countries, without the help of an operator. The task of responding to ''intercept'' calls (vacant, changed, or disconnected numbers) is being automated. A device automatically answers those calls with a computer-assembled voice response explaining the reason for interception and giving new number information. The monitoring and computing of charges on calls from pay telephones also is being automated, eliminating another function normally performed by operators. Directory assistance operators now can find numbers more quickly because they use a computerized system that shows the information on a screen, whereas before they had to leaf through paper directories. Another change, while not of a technological nature, is expected to reduce the demand for directory assistance operators. A number of telephone companies now charge customers for directory assistance calls, thus prompting customers to dial numbers directly and use telephone directories to locate unknown numbers.

Employment of PBX operators also is expected to remain relatively stable through the 1980's. Growth in the number of small businesses will generate demand for PBX services, but this expansion will be offset somewhat as large businesses convert either to more sophisticated systems that require fewer operators or to Central Exchange (CENTREX). With CENTREX, incoming and outgoing calls can be dialed directly without an operator's assistance.

Operators are less sensitive to fluctuations in the business cycle than other workers in the telephone industry. The volume of telephone calls is affected very little by the upswings and downturns in the economy. Telephone companies report that they hire fewer operators during recessions, but that is because there is less turnover (and consequently fewer openings) when other jobs are relatively hard to find. Few PBX operators are laid off during recessions because even in slow times, businesses must keep their lines of communication open.

Technological change has had a far greater effect than the business cycle on employment of telephone company operators. However, operators are seldom laid off, for collective bargaining agreements ensure that the companies reduce employment either through attrition or by retraining or reassignment.

## Earnings

Telephone companies in 1980 paid operators the following average hourly wages:

| | |
|---|---|
| All telephone operators | $7.36 |
| Chief operator | 11.73 |
| Service assistant and instructor | 8.67 |
| Experienced switchboard operator | 7.23 |
| Operator in training | 5.16 |
| Other switchboard employees | 11.48 |

Earnings of experienced telephone operators are about the same as the average for all nonsupervisory workers in private industry, except farming. A 1980 survey by the International Personnel Management Association of workers at all levels of government showed that beginning telephone operators averaged $8,388 per year, while those with experience averaged $9,996. In 1980, the Federal Government paid starting telephone operators $8,951 per year. The average annual salary that year for all operators employed by the Federal Government was $11,200.

Most telephone company operators are members of the Communications Workers of America, the International Brotherhood of Electrical Workers, or the Telecommunications International Union. For these operators, union contracts govern wage rates, wage increases, and the time required to advance from one step to the next (it normally takes 4 years to rise from the lowest paying, nonsupervisory operator position to the highest). Contracts also call for extra pay for work beyond the normal 7 1/2 hours a day or 5 days a week, and for all Sunday and holiday work. Most contracts provide a pay differential for nightwork and split shifts. Paid vacations are granted according to length of service. Usually, contracts provide for a 1-week vacation beginning with 6 months of service; 2–weeks for 1 to 6 years; 3–weeks for 7 to 14 years; 4–weeks for 15 to 24 years; and 5–weeks for 25 years and over. Depending on locality, holidays range from 9 to 11 days a year. Additional provisions include paid sick leave; group life, medical, and dental insurance; sickness and accident benefits; retirement and disability pensions; a savings plan; and an employee stock ownership plan.

Insurance, pensions, holidays, vacations, and other benefits for PBX operators are the same as those for other clerical employees in the firm.

## Related Occupations

Other workers who provide information to the general public include customer service representatives, dispatchers, hotel clerks, information clerks, police aides, receptionists, reservation agents, taxicab starters, and travel clerks.

## Sources of Additional Information

For more details about employment opportunities, contact your local telephone company or union that represents telephone workers. For general information on telephone operator jobs, write to:

International Brotherhood of Electrical Workers, 1125 15th St., NW., Washington, D.C. 20005.

Telecommunications International Union, P.O. Box 5462, Hamden, Conn. 06518.

For general information on the independent (non-Bell) telephone industry and career opportunities in it, request copies of ''Independent Phonefacts'' and ''Is it for You? A Career in the Independent Telephone Industry'' from:

United States Independent Telephone Association, 1801 K St. NW., Suite 1201, Washington, D.C. 20006.

# Typists

(D.O.T. 203.362-010, -018, .382-010, -026, .582-010, -014, -018, -034, -038, -054, and -066)

## Nature of the Work

A rapid flow of written communication is essential to the modern office. The typist helps to maintain this flow by making neat, typed copies of handwritten, printed, and recorded words.

Beginning or *junior typists* usually type headings on form letters, copy directly from handwritten drafts, and address envelopes. Often, they perform other office tasks as well: Answering telephones, filing, and operating copiers, calculators, and other office machines.

More experienced typists do work that requires a high degree of accuracy and independent judgment. *Senior typists* work from rough drafts which are difficult to read or which contain technical material. They may plan and type complicated statistical tables, combine and rearrange materials from different sources, or prepare master copies to be reproduced on copying machines.

*Clerk typists* (D.O.T. 203.362-010) combine typing with filing, sorting mail, answering telephones, and other general office work. *Varitype operators* (D.O.T. 203.382-026) produce master copies, such as stencils, on machines similar to typewriters. *Bordereau clerks* (D.O.T. 203.382-010) compile data and type applications for insurance companies. *Perforator typists* (D.O.T. 203.582-038) operate special typewriters that perforate tape or paper to facilitate the subsequent

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automatic reproduction from master copy of data such as letters and reports. *Cryptographic-machine operators* (D.O.T. 203.582-018) operate cryptographic equipment to code, transmit, and decode secret messages for units of the Armed Forces, law enforcement agencies, or business organizations. *Braille operators* (D.O.T. 203.582-010) operate typewriter-like machines that impress dots in metal sheets used in making braille books. *Braille typists* (D.O.T. 203.582-014) use braille typewriters to transcribe reading material for use by the blind.

In a growing number of organizations, word processing centers handle the transcription and typing for several departments. In these centers, *magnetic-tape-typewriter operators* (D.O.T. 203.582-034) produce letters and reports on high-speed machines that use a magnetic tape card or disk to store typed material in a programmed memory. These "computer-typewriters" eliminate a great deal of retyping because corrections can be made before the final copy is produced. *Terminal-system operators* (D.O.T. 203.362-018) operate a keyboard linked to a computer terminal to produce business, scientific, or technical publications in a printlike format. These operators use a coded command to enter, store, retrieve, or delete information, and to secure a finished copy. *Terminal operators* (D.O.T. 203.582-054) type letters or numbers onto the keyboard of an on-line computer typewriter terminal to transmit and receive data from a computer in another location. They compare the readout on a printed copy or viewing screen with the source documents to detect and then correct errors.

## Working Conditions

Typists usually work in offices that are clean and well lighted. They sit for long periods and sometimes must contend with high noise levels caused by various office machines.

Typists generally work a standard 40-hour week. In some cities, especially in the Northeast, the scheduled workweek is 37 hours or less.

Office work lends itself to alternative or flexible working arrangements and many typists hold part-time or temporary jobs. Some are freelance typists who are self-employed; others get short-term jobs through employment agencies that specialize in "office temporaries."

## Employment

Nearly 1.1 million persons worked as typists in 1980. In addition, many other workers—including secretaries, newspaper reporters, writers, and editors—used typing skills in their jobs.

Typists are employed throughout the economy. Approximately 35 percent work for business firms—chiefly those in manufacturing; wholesale and retail trade; transportation, communications, and public utilities; and finance, insurance, and real estate. Another 35 percent work in service organizations of various kinds, including educational institutions, hospitals, membership organizations, and firms that provide business services. Among the latter are "office temporaries" agencies and word processing service bureaus. About 30 percent of all typists work in Federal, State, and local government agencies.

## Training, Other Qualifications, and Advancement

Typists generally need a high school diploma. While specific hiring requirements vary a great deal, many employers require a typing speed of 45-55 words per minute. Some require word processing training or experience. Familiarity with standard office equipment, especially copiers, is an asset.

Good spelling, punctuation, and grammar are important skills for typists. Those who transcribe recorded dictation need sharp hearing. Typists should be neat, accurate, and attentive to detail. They must be able to concentrate amid distractions.

Many employers prefer applicants who have some knowledge of office practices. High schools, community colleges, business schools, and home study schools teach these skills.

A number of companies and government agencies have training programs to help clerical employees upgrade their skills and advance to more responsible positions. Many States and localities sponsor programs to train unemployed and low-skilled workers for entry jobs as typists.

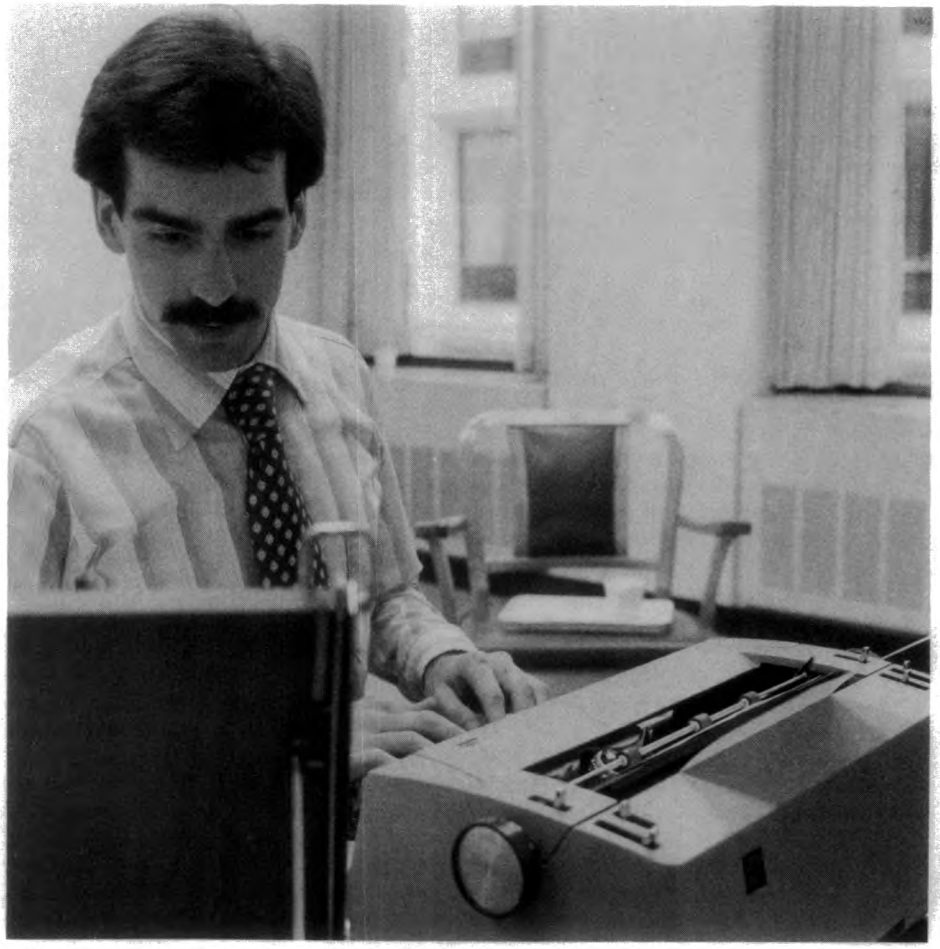
As beginners increase their skills, they often advance to higher level typing jobs. Some typists are promoted to supervisory jobs in word processing centers. Others who master additional skills can move into secretarial jobs.

## Job Outlook

The number of typists is expected to grow about as fast as the average for all occupations through the 1980's as business expansion increases the volume of paperwork. In addition to jobs resulting from the demand for more typists, many openings will occur every year because of replacement needs. Turnover in this occupation, with its relatively low skill and pay levels, is very high.

Very good job prospects are expected for typists in the years ahead, and opportunities should continue to be excellent for typists who prefer temporary or part-time work. Demand should be particularly strong for workers who are versatile enough to handle other office jobs besides typing. Many employers prefer applicants with word processing experience; some require it.

Even during slack economic periods, employment of typists is fairly stable because companies must process paperwork regard-



Many typists have part-time or temporary jobs.

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less of the level of business activity. When typists are laid off because of business or plant failures, they usually find other typist jobs easily.

## Earnings

According to a Bureau of Labor Statistics survey, beginning typists averaged $9,959 a year in 1981. Those with experience averaged $12,358 a year.

According to 1980 survey data from the American Management Associations, junior typists had average salaries of $8,996 a year; clerk-typists, $9,568; senior typists, $10,192; statistical typists, $10,192; and senior word processing operators, $11,596.

In early 1981, the Federal Government paid starting clerk-typists from $8,951 to $10,963 a year, depending on education, training, and experience. Average yearly earnings for all clerk-typists in the Federal Government were about $10,400 in 1980.

Typists generally receive higher salaries if they have word processing experience.

Most typists in large cities receive 7 paid holidays or more a year and a 2-week vacation after working 1 year. With added years of service, vacations may range to 4 weeks or more. Group life and health insurance, pension plans, and other fringe benefits often are provided.

## Related Occupations

Many other office workers use typing skills. Among these are secretaries, stenographers, receptionists, office machine operators, telephone operators, personnel clerks, and administrative assistants.

## Sources of Additional Information

Information concerning training for clerical occupations in your State is available from:

State Supervisor of Office Occupations Education, State Department of Education, State capital.

A directory of private business schools may be obtained from:

Association of Independent Colleges and Schools, 1730 M St. NW., Suite 600, Washington, D.C. 20036.

State employment offices can provide information about job openings for typists locally and nationwide.

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# Service Occupations

Workers in service occupations perform a wide variety of tasks ranging from policing streets and fighting fires to serving food and cleaning buildings. In 1980, more than 15.5 million people were employed in service jobs. The major groups of service occupations are discussed below:

*Protective service occupations*. Over 1.7 million persons were employed to safeguard lives and property in 1980. The majority were police officers, guards, or firefighters. Others included sheriffs and bailiffs, crossing guards, ski patrollers, lifeguards, and dog catchers. Most protective service workers are government employees, working primarily at the local level. Protective service work is often routine, yet sometimes dangerous.

*Food and beverage preparation and service occupations*. The largest group of service workers, about 6.2 million persons in 1980, prepare and serve food in restaurants, cafeterias, schools, hospitals, and other institutions. Workers in this group include cooks and chefs, waiters and waitresses, bartenders, kitchen workers, and food counter workers.

*Health service occupations*. Workers in this group include dental assistants, and nursing aides, orderlies, and attendants. These workers are employed in hospitals, nursing homes, rehabilitation centers, and doctors' and dentists' offices. They typically perform routine but essential tasks that involve a great deal of personal contact.

*Cleaning and building service occupations*. Workers in these occupations clean and maintain buildings such as apartments, houses, schools, and offices. The group includes janitors, elevator operators, maids, and pest controllers.

*Personal service occupations*. Workers in this group range from barbers and cosmetologists to sightseeing guides and geriatric aides. The ability to deal with all kinds of people is a "must" in these jobs. Nearly 1.7 million persons were employed in personal service jobs in 1980.

*Private household service occupations*. Most of the nearly 1 million private household workers employed in 1980 were domestic workers who cleaned their employers' homes, prepared meals, and cared for children. Others included launderers, caretakers, and companions.

## Training, Other Qualifications, and Advancement

Training and skill requirements differ greatly among the various service occupations. FBI special agents, for example, must have a college degree. Barbers and cosmetologists need specialized vocational training. Still other occupations—household workers, building custodians, and hotel bellhops, for example—have no specific educational requirements for entry, although a high school diploma is always an advantage.

For many service occupations, personality traits and special abilities may be as important as formal schooling. Thus, physical strength and endurance are a necessity for work as a porter, lifeguard, or window cleaner; and a pleasing manner and appearance are especially important for a waiter or waitress, elevator operator, or usher. Other service workers, such as store and hotel detectives and travel guides, need good judgment and should be skillful in dealing with people.

Some service workers eventually go into business for themselves as caterers or restaurant operators, for example, or proprietors of barber or beauty shops. This may be difficult for people without a good basic education and some knowledge of the business in which they work.

## Job Outlook

The service occupations are expected to grow faster than any other major occupational group through the 1980's. For example, health service occupations will grow much faster than the average for all occupations as population growth, an aging population, and continued emphasis on using auxiliary health personnel create more demand for all health care occupations. More police officers and guards will be needed in the future as population increases and the need for protection against crime, theft, and vandalism continues to grow. Rising incomes, increasing leisure time, and the growing number of women who combine family responsibilities and a job are likely to cause the demand for food service workers to grow as more people dine out. Employment of private household workers, on the other hand, is expected to experience little change, despite a strong demand for these workers. Jobs are expected to be plentiful in most service occupations because turnover is high.

Detailed information on the nature of the work, working conditions, employment, training requirements, job outlook, and earnings in many of the service occupations mentioned here is presented in the following statements.

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# Protective Service Occupations

The safety of individuals and property is essential in a civilized society. More than 1.7 million protective service workers were employed in 1980 to check crime, prevent and minimize loss of life and property, and enforce regulations that protect our safety and rights at home and on the job.

**Table 1. Employment in selected protective service occupations, 1980**

| Occupation | Employment |
|---|---|
| Guard | 650,000 |
| Police officer and sheriff | 581,000[1] |
| Firefighter | 275,000 |
| Correction officer | 103,000 |
| School crossing guard | 41,000 |
| Crossing or bridge tender | 29,000 |
| Lifeguard | 19,000 |

[1]Includes 30,000 police officers and detectives employed by the Federal Government.

SOURCE: Bureau of Labor Statistics.

About 3 out of 5 protective service workers are government employees—working primarily at the local level. During the 1980's, employment of protective service workers is expected to increase about as fast as the average for all occupations, the result of an expanding population and an increasing level of economic activity.

Careers in protective service occupations require varied combinations of education and experience. Workers such as FBI special agents must have at least a bachelor's degree, while some guards and correction officers may have less than a high school education. Most protective service occupations, however, require a high school diploma. In many cases, a college degree is an asset for advancement to higher level positions.

In addition to educational requirements, most protective service workers must undergo formal training programs and get on-the-job experience before they are fully qualified. Training programs last from several days to a few months and emphasize specific job-related skills.

Personal qualifications such as physical fitness, honesty,and an understanding of human nature are important. Persons seeking careers in protective service occupations should desire to serve the community and be able to exercise good judgment under a variety of conditions.

Although protective service jobs are usually routine, they are sometimes dangerous. Protective service workers face substantially higher risks of death or personal injury than most other occupations when confronting acts of violence, public disorder, or destruction of property. However, their jobs often afford opportunities to exercise a great deal of responsibility, to work with a minimum of direct supervision, and to work outdoors. Because protecting lives and property is an around-the-clock responsibility, many protective service occupations work at night and on weekends.

This section describes the work of several protective service occupations: Correction officers, FBI special agents, firefighters, guards, police officers, and State police officers.

## Correction Officers

(D.O.T. 372.137, .367-014, .667-018, and .677; and 375.367)

### Nature of the Work

Correction officers are charged with the safekeeping of persons who have been arrested, are awaiting trial, or who have been tried and convicted of a crime and sentenced to serve time in a correctional institution. They maintain order within the institution, enforce rules and regulations, and often supplement counseling that inmates receive from psychologists and other mental health professionals.

To make sure inmates are orderly and obey rules, correction officers keep a close watch on everything the immates do—working, exercising, eating, and bathing. They assign and supervise inmates' work assignments, as well as instruct and help them on specific tasks. Sometimes it is necessary to search inmates and their living quarters for weapons or drugs, to settle disputes between inmates, and to enforce discipline. Correction officers cannot show favoritism to any inmate and must report all who violate rules. To prevent escapes, officers serve as guards on towers and at gates. They count inmates periodically to make sure all are present.

Correction officers inspect facilities to assure the safety and security of prisoners. They check cells and other areas of the institution for unsanitary conditions, fire hazards, and evidence of infraction of rules by inmates. Periodically, they inspect locks, window bars, grill doors, and gates for tampering.

Correction officers report orally and in writing on inmate conduct and on the quality and quantity of work done by inmates. Officers also report disturbances, violations of rules, and any unusual occurrences. They usually keep a daily record of their activities.

Correction officers escort inmates to and from cells and other areas and admit and accompany authorized visitors within the facility. From time to time, they may inspect mail for contraband, administer first aid, or assist police authorities by investigating crimes committed within the institution and by searching for escaped inmates.

Counseling and helping inmates with problems also is an important part of the correction officer's job. Institutions usually employ psychologists and social workers to counsel inmates, but correction officers supplement the work of the professionals on an informal basis. Officers help inmates adjust to institutional life, prepare for later civilian life, and avoid future criminal behavior. They may arrange a change in a daily schedule so that an inmate can visit the library, help inmates get news of their families, talk over personal problems that may have led to committing a crime, or suggest where to look for a job after release from prison. In some institutions, officers have a more formal counseling role and may lead or participate in group counseling sessions.

Correction sergeants directly supervise correction officers. They usually are responsible for maintaining security and directing the activities of a group of inmates during an assigned watch or in an assigned area.

### Working Conditions

Correction officers may work indoors or outdoors, according to their duties. Some indoor areas are well lighted, heated, and ventilated, but others are overcrowded, hot, and noisy. Outdoors, they may be subject to disagreeable weather conditions. Working in a correctional institution can be hazardous, and in the past, correction officers occasionally have been injured or killed during disturbances.

Correction officers usually work an 8-hour day, 5 days a week. Prison security must be provided around the clock, which means some officers work weekends, holidays, and nights. During emergencies, officers may work overtime.

### Employment

There were about 103,000 correction officers in 1980. Nearly half worked at State correctional institutions such as prisons, prison camps, and reformatories. Most of the remainder worked at city and county jails or other institutions run by local governments. A few thousand correction officers worked at Federal correctional institutions.

Most correction officers work in relatively large institutions located outside metropolitan areas, although a significant number work in jails and other smaller facilities located in cities and towns.



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## Training, Other Qualifications, and Advancement

Most institutions require that correction officers be at least 21 years old and have a high school education or its equivalent, or qualifying work experience. They must be in good health. Many States require candidates to meet formal standards of physical fitness, eyesight, and hearing. Strength, good judgment, and the ability to think and act quickly are assets. Some States require candidates to have 1 or 2 years of experience in corrections or related police work. A few States require candidates to pass a written examination.

The Federal Government, as well as almost every State and a few localities, provides training for correction officers. Some States have special training academies. Most States, however, provide informal on-the-job training.

Academy trainees generally receive at least 4 to 8 weeks of instruction on institutional policies, regulations and procedures, the behavior and custody of inmates, writing reports, and security. On-the-job trainees receive 2 to 6 months of similar training in an actual job setting under an experienced officer. Experienced officers sometimes receive inservice training to keep abreast of new ideas and procedures.

With additional education, experience, and training, qualified officers may advance to correction sergeant or other supervisory or administrative positions. Officers sometimes transfer to related areas, such as probation and parole.

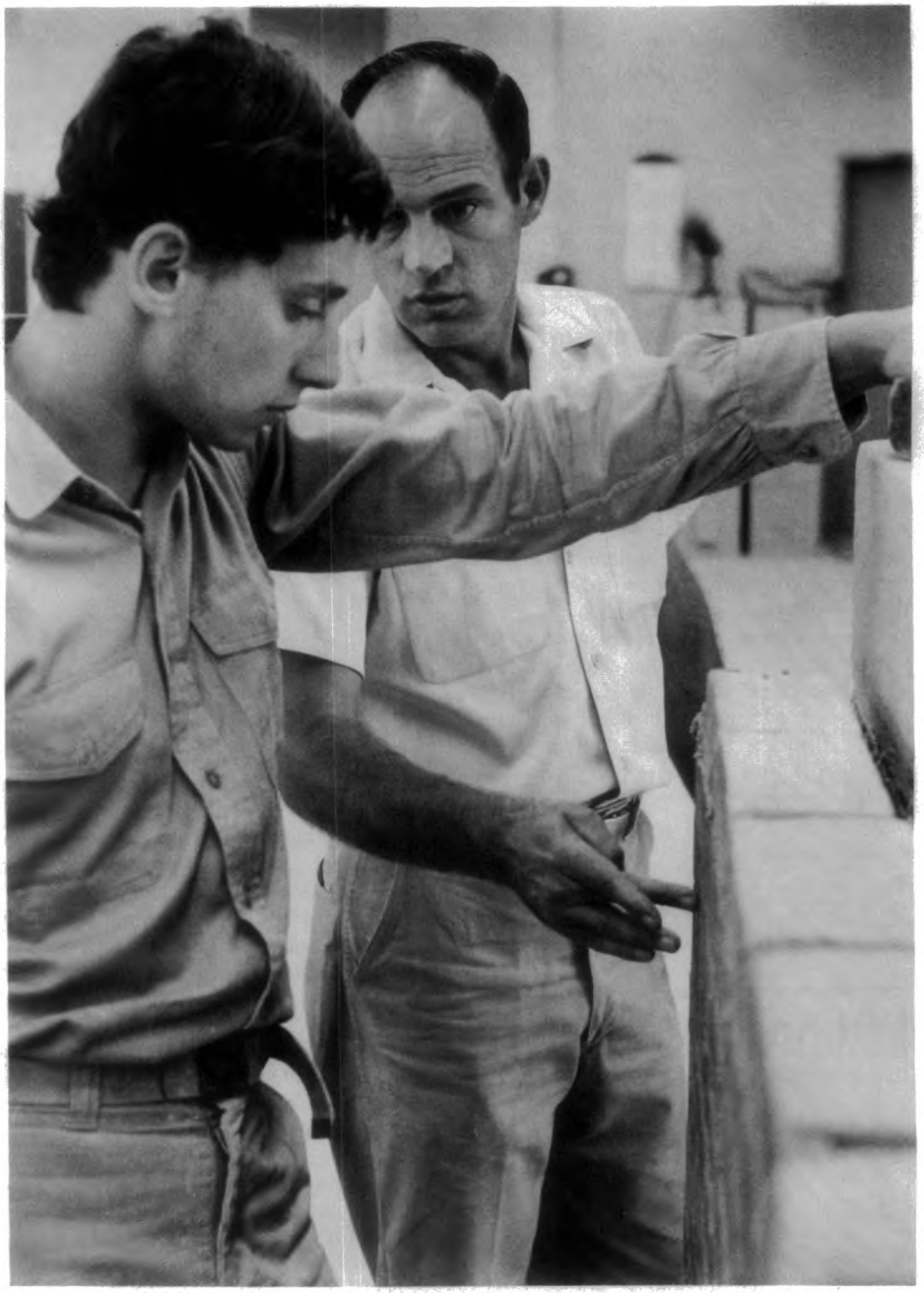
## Job Outlook

Employment of correction officers is expected to increase faster than the average for all occupations through the 1980's as additional officers are hired to supervise inmates more closely and to relieve tensions in crowded correctional institutions. Expansion and new construction of correctional facilities are also expected to create many new jobs for correction officers. Many additional job openings will result from high job turnover and the need to replace workers who retire or die.

Employment of correction officers is not usually affected by changes either in economic conditions or the overall level of government spending because security must be maintained in correctional institutions at all times. When government spending is trimmed, corrections programs are usually affected less than other programs. Even when corrections budgets are cut, correction officers are rarely laid off. With traditionally high turnover of jobs in this occupation, staffs can be cut quickly just by not replacing those who leave.

## Earnings

In 1980, salaries for correction officers varied widely by level of government. At the local level, starting salaries in 1980 averaged $10,600 a year for correction officers and $13,200 a year for supervisors.



Through informal counseling, correction officers help inmates adjust to prison life.

At the State level, correction officers averaged a starting salary of $11,900 per year in 1980 and a maximum salary of $15,800 a year, although they could earn maximum salaries of more than $20,000 in some States. Earnings of correction sergeants ranged from an average minimum of $13,650 to an average maximum of $18,350 at the State level, although they could earn more than $24,000 in some States.

At the Federal level, the starting salary was $12,266 per year; correction sergeants and other supervisory officers could advance to maximum salaries of more than $25,000 per year. The average salary for all Federal correction officers and correction sergeants was $16,300 per year.

Correction officers usually are provided uniforms or an allowance to purchase their own. Most are provided or can participate in hospitalization or major medical insurance plans; many officers can get disability and life insurance. Officers employed by the Federal Government and most State governments are covered by civil service systems or merit boards.

## Related Occupations

A number of related careers are open to high school graduates who are interested in the protective services and the field of security. *Bailiffs* guard offenders and maintain order in courtrooms during proceedings. *Bodyguards* escort and protect people from injury or invasion of privacy. *Border* and *immigration guards* take into custody persons attempting to enter the country illegally. *House* or *store detectives* patrol business establishments to protect against theft and vandalism and to enforce standards of good behavior.

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*Security guards* protect government, commercial, and industrial property against theft, vandalism, illegal entry, and fire. *Police officers* and *deputy sheriffs* maintain law and order, prevent crime, and arrest offenders.

Other corrections careers are open to persons interested in working with offenders. *Probation* and *parole officers* counsel offenders, process their release from correctional institutions, and evaluate their progress in becoming productive members of society. *Recreation leaders* organize and instruct offenders in sports, games, arts, and crafts. Many related occupations are discussed elsewhere in the *Handbook*.

### Sources of Additional Information

Information about entrance requirements, training, and career opportunities for correction officers may be obtained from Federal and State civil service commissions, State departments of correction, or nearby correctional institutions and facilities.

Information on a career as a correction officer and other corrections careers, as well as information about schools that offer criminal justice education, financial assistance, and job listings, is available from:

Contact, Inc., P.O. Box 81826, Lincoln, Neb. 68501.

Additional information on careers in corrections is also available from:

The American Correctional Association, 4321 Hartwick Rd., College Park, Md. 20740.

Newly appointed FBI agents are trained in the use of firearms.

## FBI Special Agents

(D.O.T. 375.167-042)

### Nature of the Work

Federal Bureau of Investigation (FBI) special agents investigate violations of Federal laws in connection with bank robberies, kidnappings, white-collar crime, thefts of Government property, organized crime, espionage, sabotage, and terrorism. The FBI, which is part of the U.S. Department of Justice, has jurisdiction over many different Federal investigative matters. Special agents, therefore, may be assigned to any type of case, although those with specialized training usually work on cases related to their background. Agents with an accounting background, for example, may investigate white-collar crimes such as bank embezzlements or fraudulent bankruptcies and land deals.

Because the FBI is a fact-gathering agency, its special agents function strictly as investigators, collecting evidence in cases in which the U.S. Government is or may be an interested party. In their casework, special agents conduct interviews, examine records, observe the activities of suspects, and participate in raids or arrests. Because the FBI's work is highly confidential, special agents may not disclose any of the information gathered in the course of their official duties to unauthorized persons, including members of their families. Frequently agents must testify in court about cases that they investigate.

Although they work alone on most assignments, agents communicate with their supervisors by radio or telephone as the circumstances dictate. In performing potentially dangerous duties, such as arrests and raids, two agents or more work together.

### Working Conditions

Although FBI special agents work out of clean, well-lighted offices, they spend a great deal of their time away from their desks conducting investigations. They may visit homes, offices, or industrial plants and interview persons from all walks of life. Their work requires use of automobiles and firearms and occasionally involves some risk of personal injury.

Special agents are subject to call 24 hours a day and must be available for duty at all times. Their duties require some travel, and occasionally they may be transferred to another location.

### Employment

About 8,000 persons were special agents in 1980. Most agents were assigned to the FBI's 59 field offices located throughout the Nation. They worked in cities where field office headquarters are located or in resident agencies (suboffices) in smaller cities within the field office jurisdiction. Some agents are assigned to the Bureau headquarters in Washington, D.C.

### Training, Other Qualifications, and Advancement

To be considered for appointment as an FBI special agent, an applicant usually must be a graduate of a State-accredited law school with at least 2 years of undergraduate college work; or a college graduate with a major in accounting or one of the physical sciences, a fluency in a foreign language, or with at least 3 years of full-time work experience.

Applicants for the position of FBI special agent must be U.S. citizens, be at least 23 years old but less than 35 before they begin duty, and be willing to serve anywhere in the United States or Puerto Rico. They must be capable of strenuous physical exertion and have excellent hearing and vision, normal color perception, and no physical defects that would prevent their using firearms or participating in dangerous assignments. All applicants must pass a rigid physical examination and fitness tests, as well as written and oral examinations testing their aptitude for meeting the public and conducting investigations. All of the tests except the physical examinations are given by the FBI at its facilities. Background and character investigations are made of all applicants. Appointments are made on a probationary basis and become permanent after 1 year of satisfactory service.

Newly appointed special agents are given 15 weeks of training at the FBI Academy at the U.S. Marine Corps Base in Quantico, Va., before assignment to a field office. During this period, agents receive intensive training in defensive tactics and the use of firearms. In addition, they are thoroughly schooled in Federal criminal law and procedures, FBI rules and regulations, fingerprinting, and investigative work. Agents are then assigned to a field office, where they work closely with an experienced agent for about 2 weeks before handling investigations independently.

FBI special agents who demonstrate the ability to assume more responsibility are promoted to administrative and supervisory jobs.

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## Job Outlook

The jurisdiction of the FBI has expanded greatly over the years. Although it is impossible to forecast special agent personnel requirements, employment may be expected to increase with growing FBI responsibilities.

The FBI provides a career service and its rate of turnover is traditionally low. Nevertheless, the FBI is always interested in applications from qualified persons.

## Earnings

The entrance salary for FBI special agents was $20,467 in early 1981. Special agents receive periodic within-grade salary raises if their work performance is satisfactory; they can advance in grade as they gain experience. Salaries of experienced agents at the journey grade started at $32,048; supervisory agents started at $37,871 a year.

Agents frequently work longer than the customary 40-hour week and, under specified conditions, receive overtime pay up to $5,100 a year. Agents are required to retire at age 55 if they have served at least 20 years.

## Related Occupations

FBI special agents conduct investigations and apprehend lawbreakers. Other related investigative and law enforcement occupations include: Detectives, private investigators, police officers, deputy sheriffs, Secret Service agents, Internal Revenue Service agents, Border Patrol agents, fire marshals, and fish and game wardens.

## Sources of Additional Information

The Federal Bureau of Investigation, U.S. Department of Justice, Washington, D.C. 20535.

# Firefighters

(D.O.T. 373 and 452.364-014 and .687-014)

## Nature of the Work

Every year, fires take thousands of lives and destroy property worth millions of dollars. Firefighters help protect the public against this danger. This statement gives information only about paid career firefighters; it does not cover the many thousands of volunteer firefighters in communities across the country.

During duty hours, firefighters must be prepared to respond to a fire and handle any emergency that arises. Because firefighting is dangerous and complicated, it requires organization and teamwork. At every fire, firefighters perform specific duties assigned by an officer such as a lieutenant, captain, or chief. They may connect hose lines to hydrants, operate a pump, or position ladders. Their duties may change several times while the company is in action. They may rescue victims and administer emergency medical aid, ventilate smoke-filled areas, operate equipment, and salvage the contents of buildings. Some firefighters operate fire apparatus, ambulances, emergency rescue vehicles, and fireboats.

Most fire departments also are responsible for fire prevention. They provide specially trained personnel to inspect public buildings for conditions that might cause a fire. They may check building plans, the number and working condition of fire escapes and fire doors, the storage of flammable materials, and other possible hazards. In addition, firefighters educate the public about fire prevention and safety measures. They frequently speak on this subject before school assemblies and civic groups, and, in some communities, they inspect private homes for fire hazards.

Between alarms, they have practice drills and classroom training and clean and maintain equipment.

## Working Conditions

Firefighters spend much of their time at fire stations which usually have facilities for dining and sleeping. When an alarm comes in, firefighters must respond, rapidly, regardless of the weather or hour. They may spend long periods outdoors at fires and other emergencies in adverse weather.

Firefighting is among the most hazardous occupations. It involves risk of death or injury from sudden cave-ins of floors or toppling walls and from exposure to flames and smoke. Firefighters also may come in contact with poisonous, flammable, and explosive gases and chemicals.

In some cities, firefighters are on duty for 24 hours, then off for 48 hours, and receive an extra day off at intervals. In other cities, they work a day shift of 10 hours for 3 or 4 days, a night shift of 14 hours for 3 or 4 nights, have 3 or 4 days off, and then repeat the cycle. Although in many large cities, particularly in the East, firefighters work a 40-hour week, some firefighters average as many as 56 hours. In addition firefighters often work extra hours when bringing a fire under control. Fire lieutenants and fire captains work the same hours as the firefighters they supervise. Duty hours may include some time when firefighters are free to read, study, or pursue other personal interests.

## Employment

Nearly 275,000 persons worked as firefighters in 1980. More than 9 out of 10 worked in municipal fire departments. Some very large cities have several thousand firefighters, while many small towns have only a few. Some firefighters work in fire departments on Federal and State installations, including airports.

## Training, Other Qualifications, and Advancement

Applicants for municipal firefighting jobs may have to pass a written test, a medical examination, and tests of strength, physical stamina, and agility. These examinations are open to persons who are at least 18 years of age and have a high school education or the equivalent. Those who receive the highest scores have the best chances for appointment. Extra credit usually is given for military service. Experience as a volunteer firefighter or in the Armed Forces also may improve an applicant's chances for appointment.

As a rule, beginners in large fire departments are trained for several weeks at the city's fire school. Through classroom instruction and practical training, the recruits study firefighting techniques, fire prevention, local building codes, and emergency medical techniques; also, they learn how to use axes, saws, chemical extinguishers, ladders, and other firefighting and rescue equipment. After completing this training, they are assigned to a fire company where they are evaluated during a probationary period.

A small but growing number of fire departments have accredited apprenticeship programs lasting 3 to 4 years. These programs combine formal, technical instruction with on-the-job training under the supervision of experienced firefighters. Technical instruction covers subjects such as firefighting techniques and equipment, chemical hazards associated with various combustible building materials, emergency medical techniques, and fire prevention and safety.

Experienced firefighters often continue to study to improve their job performance and prepare for promotion examinations. To progress to higher level positions, firefighters must acquire expertise in firefighting, building construction, emergency medical techniques, writing, public speaking, management and budgeting procedures, and labor relations. Fire departments frequently conduct training programs, and many colleges and universities offer courses such as fire engineering and fire science that are helpful to firefighters.

Among the personal qualities firefighters need are mental alertness, courage, mechanical aptitude, endurance, and a sense of public service. Initiative and good judgment are extremely important because firefighters often must make quick decisions in emergency situations. Because members of a crew eat, sleep, and work closely together under conditions of stress and danger, they should be dependable and able to get along well with others in a group. Leadership qualities are assets for officers, who must establish and maintain discipline and efficiency as well as direct the activities of firefighters in their companies.

Opportunities for promotion are good in most fire departments. As firefighters gain experience, they may advance to a higher rank. After 3 to 5 years of service, they may become eligible for promotion to the grade of lieutenant. The line of further promotion usually is to captain, then battalion chief, assistant chief, deputy chief, and finally to chief. Advancement generally depends upon scores

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Firefighting requires organization and teamwork.

on a written examination, performance on the job, and seniority.

## Job Outlook

Employment of firefighters is expected to increase about as fast as the average for all occupations through the 1980's to meet the growing need for fire protection. Employment should rise as new fire departments are formed and as others enlarge their fire prevention sections. Much of the expected increase will occur in smaller communities with expanding populations that replace volunteer with career firefighters to better meet growing, increasingly complex fire protection needs. Additional firefighters also may be required as more cities shorten the workweek for firefighters. Besides job openings resulting from the increased demand for firefighters, many other openings will become available each year due to the need to replace those who transfer from the occupation, retire, or die.

Firefighting attracts many people because the work is frequently exciting and challenging and affords an opportunity to perform a valuable public service. Consquently, the number of qualified applicants in most areas generally exceeds the number of job openings, even though the written examination and physical requirements eliminate many applicants. This situation is expected to persist through the 1980's. Opportunities should be best in smaller communities.

Layoffs of firefighters are not common. Fire protection is an essential service, and citizens are likely to exert considerable pressure on city officials to expand or at least preserve the present level of fire-protection coverage. Even when budget cuts do occur, local fire departments usually cut expenses by postponing equipment purchases or the hiring of new firefighters.

## Earnings

In 1980, entrance salaries for beginning full-time firefighters averaged nearly $14,400 a year, ranging from about $13,100 to $16,100, depending on city size and region of the country. Maximum salaries averaged nearly $18,200 and varied from $16,400 to $20,500 annually. Earnings for firefighters are lowest in the South and highest in the West, and generally are higher in large cities than in small ones. Average earnings of all firefighters are about one and one-third times as much as the average of all nonsupervisory workers in private industry, except farming.

Practically all fire departments provide protective clothing (helmets, boots, and coats) and many also provide dress uniforms. Firefighters generally are covered by liberal pension plans that often provide retirement at half pay at age 50 after 25 years of service or at any age if disabled in the line of duty.

About 8 out of 10 firefighters are members of the International Association of Firefighters (AFL-CIO).

## Related Occupations

Firefighters work to prevent fires and to save lives and property when fires do occur. Related fire protection occupations include fire rangers, forest-fire fighters, and smoke jumpers who work to prevent and suppress forest fires; and fire-protection engineers who identify fire hazards in homes and workplaces and design prevention programs and automatic fire detection and extinguishing systems. Other occupations in which workers respond to emergencies include police officers and emergency medical technicians.

## Sources of Additional Information

Information on obtaining a job as a firefighter is available from local civil service commission offices or fire departments.

Information about a career as a firefighter may be obtained from:

International Association of Fire Chiefs, 1329 18th St. NW., Washington, D.C. 20036.

International Association of Fire Fighters, 1750 New York Ave. NW., Washington, D.C. 20006.

Information about firefighter professional qualifications may be obtained from:

National Fire Protection Association, Batterymarch Park, Quincy, Mass. 02269.

Additional information on the salaries and hours of work of firefighters in various cities is published annually by the International City Management Association in its *Municipal Yearbook*, which is available in many libraries.

# Guards

(D.O.T. 372.267 through .367-010, .563, .567-010, .667-010 and -030 through -038; and 376.667-018.)

## Nature of the Work

Guards patrol and inspect property to protect it against fire, theft, vandalism, and illegal entry. Their duties vary with the size, type, and location of their employer.

In office buildings, banks, hospitals, and department stores, guards protect records, merchandise, money, and equipment. In department stores they often work with undercover detectives watching for theft by customers or store employees.

At ports and railroads, guards protect merchandise being shipped as well as property and equipment. They insure that nothing is stolen while being loaded or unloaded, and watch for fires, prowlers, and trouble among work crews. Sometimes they direct traffic.

Guards who work in public buildings, such as museums or art galleries, protect paintings and exhibits. They also answer routine questions from visitors and sometimes guide traffic.

In factories, laboratories, and military bases where valuable property or information must be protected, guards check the credentials of persons and vehicles entering and leaving the premises. University, park, or recreation guards perform similar duties and also may issue parking permits and direct traffic.

At social affairs, sports events, conventions, and other public gatherings, guards maintain order, give information, and watch for persons who may cause trouble.

In a large organization, a security officer often is in charge of the guard force; in a small organization, a single worker may be responsible for security. Patrolling usually is done on foot, but if the property is large, guards may make their rounds by car or motor scooter.

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As they make their rounds, guards check all doors and windows, see that no unauthorized persons remain after working hours, and insure that fire extinguishers, alarms, sprinkler systems, furnaces, and various electrical and plumbing systems are working properly. They sometimes set thermostats or turn on lights for janitorial workers.

Guards usually are uniformed and often carry a nightstick and gun. They also may carry a flashlight, whistle, 2-way radio, and a watch clock—a device that indicates the time at which they reach various checkpoints.

Correction officers, guards who work in prisons and other correctional institutions, are discussed elsewhere in the *Handbook*.

## Working Conditions

Guards work indoors and outdoors patrolling buildings, industrial plants, and grounds. Indoors, they may be stationed at a guard desk to monitor electronic security and surveillance devices or check the credentials of persons entering or leaving the premises. They also may be stationed at gate shelters or may patrol grounds in all weather.

Since guards often work alone, no one is nearby to help if an accident or injury occurs. Some large firms, therefore, use a reporting service that enables guards to be in constant contact with a central station outside the plant. If they fail to transmit an expected signal, the central station investigates. Guard work is usually routine, but guards must be constantly alert for threats to themselves and to the property that they are protecting. Guards who work during the day may have a great deal of contact with other employees and members of the public.

Many guards work alone at night; the usual shift lasts 8 hours. Some employers have three shifts where guards rotate to divide daytime, weekend, and holiday work equally. Guards usually eat on the job instead of taking a regular lunch break.

## Employment

In 1980, almost 650,000 persons worked as guards. Industrial security firms and guard agencies employ about one-half of all guards. These organizations provide security services on contract, assigning their guards to buildings and other sites as needed. The other half are employed by banks; building management companies; hotels; retail stores; utilities; schools, colleges, and universities; manufacturers; and Federal, State, and local governments.

Although guard jobs are found throughout the country, most are located in metropolitan areas.

## Training, Other Qualifications, and Advancement

Most employers prefer guards who are high school graduates. Applicants with less than a high school education also can qualify if they pass reading and writing tests and demonstrate competence in following written and oral instructions. Some jobs require a driver's permit. Employers also seek people who have had experience in the military police or in State and local police departments. Most persons who enter guard jobs have prior work experience, although it is usually unrelated. Some have retired from military careers or other protective services, and guard employment is a second career.

Candidates for guard jobs in the Federal Government must have some experience as guards and pass a written examination. Armed forces experience also is an asset. For most Federal guard positions, applicants must qualify in the use of firearms. Some jobs require a driver's permit.

Many employers give newly hired guards instruction before they start the job and also provide several weeks of on-the-job training. Guards may be taught to use firearms, to administer first aid, to operate alarm systems and electronic security equipment, and to spot and deal with security problems.

Applicants are expected to have good character references, no police record, good health—especially in hearing and vision—and good personal habits such as neatness and dependability. They should be mentally alert, emotionally stable, and physically fit to cope with emergencies. Some employers require guards to meet height and weight specifications or to be within a certain age range.

Although guards in small companies receive periodic salary increases, advancement is likely to be limited. However, most large organizations use a military type of ranking that offers advancement in position and salary. Guard experience enables some persons to transfer to police jobs that offer higher pay and greater opportunities for advancement. Guards with some college education may advance to jobs that involve administrative duties or the prevention of espionage and sabotage.

## Job Outlook

Employment of guards is expected to grow as fast as the average for all occupations through the 1980's. The level of business investment in plant and equipment—and security systems to protect them—has a major influence on how many guards will be required. Greater investment would cause greater growth in the number of guard jobs. Increased concern about crime and vandalism will also heighten the need for security in and around plants, stores, and recreation areas and is expected to cause growth of agency guard employment. Additional guards will be needed by banks, manufacturing plants, and Federal, State, and local governments to provide better security and monitor remote cameras, alarm systems, and other electronic surveillance equipment. Many openings also will arise as guards retire, die, or leave their jobs for other reasons. Opportunities will be most plentiful for persons seeking work on night shifts.

Guards who work during the day may have a great deal of contact with others.

Guards employed by industrial security and guard agencies occasionally are laid off when the firm where they work does not renew its contract with their agency. Most are able to find employment with other agencies, however. Guards employed directly by the firm at which they work are seldom laid off because a plant or factory must still be protected even when economic conditions force it to close temporarily.

## Earnings

Guards working in 36 urban areas were estimated to average $4.22 an hour in 1980, about two-thirds as much as the average earnings for all nonsupervisory workers in private industry, except farming. Those working in the North Central States earned more than the average, while guards employed in the South earned somewhat less. Hourly wages of guards were estimated to average $7.04 in manufacturing; $7.27 in public utilities; $5.38 in banking, finance, insurance, and real estate; $5.19 in wholesale trade; $4.84 in retail trade; and $3.45 in the various service industries, including security and guard agencies. Guards with specialized training or some supervisory responsibilities averaged $5.48 an hour, while those with less training and responsibility averaged $3.99 an hour. Guards employed by industrial security and guard agencies generally started at the minimum wage, $3.35 an hour in 1981.

Depending on their experience, newly hired guards in the Federal Government earned between $9,766 and $10,963 a year in early 1981. Guards employed by the Federal Government averaged $13,973 a year. These workers usually receive overtime pay as well as a wage differential for the second and third shifts. Many guards have paid vacations, sick leave, and insurance and pension plans.

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## Related Occupations

Guards protect property, maintain security, and enforce standards of conduct. Other related security and protective service occupations include: Bailiffs, border guards, bouncers, correction officers, deputy sheriffs, fish and game wardens, house or store detectives, police officers, and private investigators.

## Sources of Additional Information

Further information about work opportunities for guards is available from local employers and the nearest State employment service office.

# Police Officers

(D.O.T. 375.133-010 through .137-018, .137-026 through .167-022, .167-030 through -038, .167-046, .263-010 and -014, .267, and .384; and 377 through .264 and .667-018)

## Nature of the Work

The safety of our Nation's cities and towns greatly depends on the work of local police officers and sheriffs' deputies whose responsibilities range from controlling traffic to preventing and investigating crimes. Whether on or off duty, these officers are expected to exercise their authority whenever necessary.

Police officers and sheriffs' deputies who work in small communities and rural areas have many duties. In the course of a day's work, they may direct traffic at the scene of a fire, investigate a housebreaking, and give first aid to an accident victim. In a large police department, by contrast, officers usually are assigned to a specific type of duty. Most officers are detailed either to patrol or to traffic duty; smaller numbers are assigned to special work such as accident prevention or operation of communications systems. Others work as detectives (plainclothes officers) assigned to criminal investigation; still others are experts in chemical and microscopic analysis, firearms identification, and handwriting and fingerprint identification. In very large cities, a few officers may work with special units such as mounted and motorcycle police, harbor patrols, helicopter patrols, canine corps, mobile rescue teams, and youth aid services.

Most new recruits begin on patrol duty, riding in a police vehicle or walking on "foot" patrol. They may work alone with other officers in such varied areas as congested business districts or outlying residential neighborhood. In any case, new officers become thoroughly familiar with conditions throughout their area and, while on patrol, remain alert for anything unusual. They note suspicious circumstances, such as open windows or lights in vacant buildings, as well as hazards to public safety such as burned-out street lights or fallen trees. Officers enforce traffic regulations and also watch for stolen automobiles. At regular intervals, officers report to police headquarters from call boxes, radios, or walkie-talkies. They prepare reports about their activities and testify in court when arrests result in legal action.

Police officers must be able to give an accurate, detailed account.

## Working Conditions

Police officers usually work 40 hours a week. Because police protection must be provided around the clock in all but the smallest communities, some officers work over weekends, on holidays, and at night. Police officers are subject to call any time their services are needed and may work overtime during emergencies.

Police officers may have to work outdoors for long periods in all kinds of weather. The injury rate is higher than in many occupations and reflects the risks officers take in pursuing speeding motorists, capturing lawbreakers, and dealing with public disorder.

## Employment

About 495,000 full-time officers worked for local police and sheriffs' departments in 1980. The majority were employed by cities with more than 25,000 inhabitants. Some cities have very large police forces. For example, New York had about 24,000 police officers and Chicago nearly 13,000. Hundreds of small communities employ fewer than 25 officers each.

## Training, Other Qualifications, and Advancment

Local civil service regulations govern the appointment of police officers in practically all large cities and in many small ones. Candidates must be U.S. citizens, usually at least 21 years of age, and must meet certain height, weight, and vision standards. Eligibility for appointment depends on performance in competitive written examinations as well as on education and experience. Physical examinations often include tests of strength and agility.

Because personal characteristics such as honesty, good judgment, and a sense of responsibility are especially important in police work, candidates are interviewed by a senior officer at police headquarters, and their character traits and background are investigated. In some police departments, candidates also may be interviewed by a psychiatrist or a psychologist, or be given a personality test. Although police officers work independently, they must perform their duties in accordance with laws and departmental rules. They should enjoy working with people and serving the public.

In large police departments, where most jobs are found, applicants usually must have a high school education. A few cities require some college training and some hire law enforcement students as police interns. A few police departments accept applicants who

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have less than a high school education as recruits, particularly if they have worked in a field related to law enforcement.

More and more, police departments are encouraging applicants to take post-high school training in law enforcement. Many junior colleges, colleges, and universities offer programs in law enforcement or administration of justice. Other courses helpful in preparing for a police career include English, American history, public administration, business law, chemistry, and physics. Physical education and sports are especially helpful in developing the stamina and agility needed for police work. A knowledge of Spanish is an asset in areas with large Spanish-speaking populations.

Some large cities hire high school graduates who are still in their teens as civilian police cadets or trainees. They do clerical work and attending classes and are appointed to the regular force at age 21 if qualified.

Before their first assignments, officers usually go through a period of training. In small communities, recruits work for a short time with experienced officers. In large city police departments, they get more formal training that may last several weeks or a few months. This training includes classroom instruction in constitutional law and civil rights, State laws and local ordinances, and accident investigation. Recruits also receive training and supervised experience in patrol, traffic control, use of firearms, self-defense, first aid, and handling emergencies.

Police officers usually become eligible for promotion after a specified length of service. In a large department, promotion may allow an officer to specialize in one type of police work such as plainclothes investigation, laboratory analysis of evidence, traffic control, communications, or working with juveniles. Promotions to sergeant, lieutenant, and captain usually are made according to a candidate's position on a promotion list, as determined by scores on a written examination and on-the-job performance.

Many types of training help police officers improve their job performance and advance. Through training given at police department academies and colleges, officers keep abreast of crowd-control techniques, civil defense, legal developments that affect their work, and advances in law enforcement equipment. Many police departments pay all or part of the tuition for officers to work toward college associate and bachelor's degrees in law enforcement, police science, administration of justice, or public administration.

### Job Outlook

Employment of police officers is expected to grow about as fast as the average for all occupations through the 1980's as the Nation's population and police protection needs increase. Employment growth will be tempered by increased use of civilian police department employees in traffic control, parking enforcement, administration, and other routine, nonhazardous areas of police work. The level of local government spending influences the employment of police officers. However, police officers who lose their jobs from budget cuts usually have little difficulty finding jobs with other police departments.

Police work is attractive to many. The job frequently is challenging and involves much responsibility. Furthermore, in some communities police officers may retire with a pension to pursue a second career before age 50. Although written examinations and strict physical requirements always eliminate many applicants, competition is expected to be keen for job openings through the 1980's. The outlook should be good for persons having some college training in law enforcement.

### Earnings

In early 1980, entry level salaries for police officers employed in medium- and large-sized cities averaged nearly $15,200 a year, although they varied widely from city to city. In some smaller communities, officers started at about $13,000 a year, while some major cities offered over $16,500 a year to new employees. Most officers receive regular salary increases during the first few years of employment until they reach a set maximum for their rank. Maximum earnings of nonsupervisory officers averaged $19,100 a year in early 1980, and exceeded $20,500 a year in some of the largest cities. Promotion to a higher rank brings a higher basic salary.

Police departments usually provide officers with special allowances for uniforms and furnish revolvers, night sticks, handcuffs, and other required equipment. Because police officers generally are covered by liberal pension plans, many retire at half pay after 20 or 25 years of service.

### Related Occupations

Police officers maintain law and order in the Nation's cities, towns, and rural areas. Other related law enforcement occupations include State police officers, FBI special agents, Internal Revenue Service agents, Secret Service agents, Border Patrol agents, fire marshals, and fish and game wardens.

### Sources of Additional Information

Information about entrance requirements may be obtained from local civil service commissions or police departments.

## State Police Officers

(D.O.T. 375.133-010; .137 except -018; .163; .167 through -022, -034, and -038; .263-010 and -018; .267 except -030; and .384)

### Nature of the Work

The laws and regulations that govern the use of our Nation's highways are designed to insure the safety of all citizens. State police officers (sometimes called State troopers or highway patrol officers) patrol our highways and enforce these laws and regulations.

State police officers issue traffic tickets to motorists who violate the law. At the scene of an accident, they direct traffic, give first aid, call for emergency equipment including ambulances, and write reports which may be used to determine the cause of the accident.

In addition, State police officers provide services to motorists on the highways. For example, they radio for road service for drivers with mechanical trouble, direct tourists to their destination, or give information about lodging, restaurants, and tourist attractions.

State police officers also provide traffic assistance and control during road repairs, fires, and other emergencies, as well as during special occurrences such as parades and sports events. They sometimes check the weight of commercial vehicles, conduct driver examinations, and give information on highway safety to the public.

In addition to highway responsibilities, State police in the majority of States also enforce criminal laws. In communities and counties that do not have a local police force or a large sheriff's department, the State police are the primary law enforcement agency, investigating crimes such as burglary or assult. They also may help city or county police catch lawbreakers and control civil disturbances. State highway patrols, however, normally are restricted to apprehending criminals on State highways, and to vehicle safety and traffic matters.

Some officers work with special State police units that conduct criminal investigations and collect evidence at the scenes of crimes. Others instruct trainees in State police schools, pilot police aircraft, or specialize in fingerprint classification or chemical and microscopic analysis of criminal evidence.

State police officers also write reports and maintain police records. Some officers, such as division or bureau chiefs are responsible for training or investigation and those who command police operations in an assigned area, have administrative and supervisory duties.

### Working Conditions

Although the work of State police officers usually is routine, it sometimes is dangerous. They run the risk of an accident while pursuing criminals or patrolling in bad weather. Officers also face the risk of injury while apprehending criminals or controlling disorders. They often work alone when on patrol.

In most States, officers work 40 hours a week. Although the workweek is longer in some States, the trend is toward a 40-hour week. Since police protection must be provided around the clock, some officers are on duty over weekends, on holidays, and at night. Police officers also are subject to emergency calls at any time.

### Employment

About 55,000 State police officers were employed in 1980. The size of State police

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In addition to patrolling highways and investigating crimes, State police officers write reports and maintain records.

forces varies considerably. The largest force (in California) has about 5,000 officers; the smallest (in North Dakota) has about 100. Thirteen States employed more than 1,000 officers. One State (Hawaii) does not maintain a police force.

## Training, Other Qualifications, and Advancement

State civil service regulations govern the appointment of State police officers. Candidates must be U.S. citizens. Other entry requirements vary, but most States require that applicants have a high school education or an equivalent combination of education and experience and be at least 21 years old.

Officers must pass a competitive examination and often must meet physical and personal qualifications. Physical requirements, strength and agility often are required. Because honesty and a sense of responsibility are important in police work, an applicant's character and background are investigated.

In all States, recruits enter a formal training program for several months. They receive classroom instruction in State laws and jurisdictions, and they study procedures for accident investigation, patrol, and traffic control. Recruits learn to handle firearms, defend themselves from attack, handle an automobile at high speeds, and give first aid. Some experienced officers take advanced training in police science, administration, law enforcement, or criminology at junior colleges, colleges and universities, or special police institutions such as the National Academy of the Federal Bureau of Investigation.

High school and college courses in English, government, psychology, sociology, American history, business law, chemistry, and physics help in preparing for a police career. Physical education and sports are useful for developing stamina and agility. Driver education courses and military police training also are helpful.

Police officer recruits serve a probationary period ranging from 6 months to 3 years. After a specified length of time, officers become eligible for promotion. Most States have merit promotion systems that require officers to pass a competitive examination to qualify for the next highest rank. The typical avenue of advancement is from private to corporal, to sergeant, to first sergeant, to lieutenant, and then to captain.

In some States, recent high school graduates may enter State police work as paid civilian cadets. They perform nonenforcement duties and attend classes on police work. Cadets who qualify may be appointed to the State police force at age 21.

## Job Outlook

In most States, the number of applicants generally exceeds the number of openings in this occupation, and this situation is expected to continue through the 1980's. Opportunities are expected to be best for women and members of minorities.

State police employment is expected to grow more slowly than the average for all occupations through the 1980's. Most openings will be created as officers retire, die, or leave the occupation for other reasons.

Although some State police will be needed in criminal investigation and other nonhighway functions, the greatest demand will continue to be for highway patrol work. In ever-increasing numbers, Americans have been using motor vehicles for transportation and recreation. This growth probably will continue, requiring additional officers to control traffic and maintain highway safety.

Because law enforcement work is becoming more complex, specialists will be needed in crime laboratories and electronic data processing centers to develop administrative and criminal information systems. However, in many departments, these jobs will be filled by civilian employees rather than by uniformed officers.

Layoffs of State police officers are rare. While their employment depends on the level of public funding, it is not particularly sensitive to general downturns in the economy. If State police budgets are trimmed, any reduction in employment is usually handled through attrition.

## Earnings

In 1980, beginning salaries for State police officers averaged about $14,000 a year. Officers generally receive regular salary increases, based on experience and performance, until a specified maximum is reached. Maximum sal-

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aries averaged about $18,500 a year, but ranged to well over $20,000 a year in some States. Salaries are normally higher than average in the West and lower in the South.

Starting salaries of State police sergeants averaged $16,500 a year in 1980; maximum salaries averaged $21,600. Starting salaries of lieutenants averaged $18,100 a year; maximum salaries, $23,800.

State police agencies usually provide officers with uniforms, firearms, and other necessary equipment, or give special allowances for their purchase. State police officers usually are covered by liberal pension plans.

## Related Occupations

State police officers patrol the Nation's highways and enforce its laws, apprehending speeders and more dangerous lawbreakers. Related law enforcement occupations include local police officers, deputy sheriffs, detectives, FBI special agents, Secret Service agents, Internal Revenue Service agents, Border Patrol agents, fire marshals, and fish and game wardens.

## Sources of Additional Information

Information about specific entrance requirements may be obtained from State civil service commissions or State police headquarters, usually located in each State capital.

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# Food and Beverage Preparation and Service Occupations

This section of the *Handbook* includes workers who prepare and serve food and beverages for restaurants, hotels, clubs, bars, factories and school cafeterias, catering firms, and other establishments. They cook and serve food, mix and serve drinks, and do many other related tasks. Since so many of these jobs involve dealing with the public—tact, courtesy, and a pleasant personality are important. The work is often hectic, and the ability to maintain an even disposition and a sense of humor while working under pressure is necessary to do the job well. Physical stamina is also very important since most of these workers spend long periods of time on their feet and sometimes carry heavy loads of food and dishes.

Food and beverage preparation and service workers make up one of the largest occupational groups in the Nation's labor force. In 1980, about 6.2 million persons were employed in this field, more than three times as many as automobile and steel manufacturing combined. Waiters and waitresses constitute the largest single occupation, numbering over 1.7 million. The accompanying table indicates estimated 1980 employment for occupations in this field.

Job opportunities exist almost everywhere and for almost any interested person, including those who have limited skills or little formal education. Skills usually are learned through on-the-job training. Many restaurants hire inexperienced persons as waiters' assistants, kitchen helpers, food counter workers, waiters and waitresses, or bartenders. Experience sometimes is necessary, however, to obtain one of these positions in a large restaurant or catering firm. Also, courses in cooking, catering, and bartending offered by public and private vocational schools can be helpful. Previous employment as a kitchen helper or assistant cook often is necessary to get a job as a cook. Experienced workers may advance to food service manager, maitre d'hotel, head cook, or chef. Completion of a college program in hotel and restaurant administration is valuable to those seeking top managerial positions.

Starting pay for many of these jobs is very low. However, tips may add substantially to income.

Employment of these workers is expected to increase faster than the average for all occupations through the 1980's. Demand will increase as new restaurants, cafeterias, and bars open in response to population growth and increased spending for food and beverages outside the home. Higher average incomes and more leisure time will enable people to dine out more often. Also, as more wives work, more families may find dining out a welcome convenience. In addition to growth in demand for these workers, thousands of job openings will occur each year from high turnover, especially among students working part time.

Detailed discussions of the work, training, job outlook, and earnings of waiters' assistants and kitchen helpers, food counter workers, waiters and waitresses, cooks and chefs, and bartenders are presented in the statements that follow.

**Table 1. Employment in selected food and beverage preparation and service occupations, 1980**

| Occupation | Employment |
|---|---|
| Waiter and waitress | 1,711,000 |
| Cook, except private household | 1,122,000 |
| Cook, short order and specialty fast foods | 456,000 |
| Cook, restaurant | 355,000 |
| Cook, institutional | 311,000 |
| Waiter's assistant and kitchen helper | 1,120,000 |
| Kitchen helper | 840,000 |
| Waiter's assistant | 280,000 |
| Food preparation and service worker, fast food restaurant | 806,000 |
| Bartender | 382,000 |
| Butcher and meat cutter | 190,000 |
| Host/hostess, restaurant, lounge, or coffee shop | 116,000 |
| Pantry, sandwich, and coffee maker | 71,000 |
| Baker, bread and pastry | 48,000 |

SOURCE: Bureau of Labor Statistics.

# Bartenders

(D.O.T. 312.474 and .477)

## Nature of the Work

Screaming Zombies, Harvey Wallbangers, Golden Cadillacs, and Singapore Slings are just a few of the exotic cocktails embodied in the art of mixology, or bartending. Bartenders make these concoctions by combining, in exact proportion, ingredients selected from what may seem a bewildering variety of liquors, wines, and mixes. A well-stocked bar contains dozens of types and brands of liquors and wines, plus soft drinks, fruits and fruit juices, cream, and soda and tonic water. In addition, bartenders serve beer and wine by themselves, and a wide variety of nonalcoholic beverages.

Bartenders take drink orders from waiters and waitresses serving customers seated in the restaurant or lounge, as well as from customers seated at the bar. Because some people like their cocktails made a certain way, bartenders often are asked to mix drinks to suit a customer's taste. Most bartenders must know dozens of drink recipes and be able to mix drinks accurately by sight alone so they can serve drinks quickly, without wasting anything, even during the busiest periods. Besides mixing and serving drinks, bartenders collect payment, operate the cash register, clean up after customers have left, and may also serve limited food items or snacks to customers seated at the bar.

More operations, especially larger ones, are using equipment that mixes drinks automatically. However, bartenders still must be efficient and knowledgeable to handle unusual orders and to work when the automatic equipment is not functioning.

Bartenders usually are responsible for ordering and maintaining an inventory of liquor, mixes, and other bar supplies. They also arrange the bottles and glassware into attractive displays and often wash glassware.

Some bartenders own a tavern or bar and, therefore, also must keep their own business records and hire, train, and direct staff.

## Working Conditions

Many bartenders work more than 40 hours a week, and night and weekend work and split shifts are common. Better than average strength sometimes is necessary to lift heavy cases of liquors or mixes. Also, bartenders have to work quickly and under pressure in a popular bar during busy periods.

For many bartenders, however, the opportunity for friendly conversation with customers and the possibility of someday managing or owning a bar or restaurant more than offset these disadvantages. For others, the opportunity to get part-time work is important.

## Employment

Most of the 382,000 bartenders employed in 1980 worked in restaurants and bars; others had jobs in hotels and private clubs. Almost 1 bartender in 10 was self-employed. Many people tend bar part time while working in other occupations or attending college.

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Many bartenders work in restaurants and hotels.

Often they serve at banquets and private parties which are held at restaurants, hotels, or even private homes.

Seasonal employment is available in vacation resorts, and some bartenders migrate between summer and winter resorts rather than remain in one area the entire year.

## Training, Other Qualifications, and Advancement

Most bartenders learn their trade on the job. Although preparing drinks at home can be good practice, it does not qualify a person to be a bartender. Besides knowing a variety of cocktail recipes, bartenders must know how to stock a bar properly and be familiar with State and local laws concerning the sale of alcoholic beverages.

Persons who wish to become bartenders can get good experience by working as bartender helpers, waiters' assistants, or waiters or waitresses. By watching a bartender at work, they can learn how to mix drinks and do other bartending tasks. However, one must practice to become proficient.

Many vocational and technical schools offer short courses in bartending that include instruction on State and local laws and regulations, cocktail recipes, attire and conduct, and stocking a bar. Some of these schools help their graduates find jobs.

Since they deal with the public, bartenders should have a pleasant personality and a neat and clean appearance. Physical stamina also is necessary, because they stand while working and may be required to lift heavy kegs of beer or cases of beverages.

Generally, bartenders must be at least 21 years of age, although some employers prefer those who are 25 or older. Some States require bartenders to have health certificates assuring that they are free of contagious diseases. In some instances, they must be bonded.

Small restaurants, neighborhood bars, and resorts usually offer a beginner the best opportunities. After gaining experience, a bartender may wish to work in a large restaurant or cocktail lounge where pay is higher and opportunities for promotion are greater. Although opportunities for promotion in this field are limited, it is possible to advance to head bartender, wine steward, or beverage manager. Some bartenders open their own businesses.

## Job Outlook

Employment of bartenders is expected to increase about as fast as the average for all occupations through the 1980's. In addition to the job openings caused by growth in demand for bartenders, many openings will arise annually from the need to replace experienced bartenders who retire, die, or leave the occupation for other reasons. Because many bartenders are students, or others who do not plan careers in this occupation, job turnover is relatively high.

The demand for bartenders will increase as new restaurants, hotels, and bars open in response to population growth and as spending on food and beverages outside the home increases. Higher personal incomes and more leisure time will allow people to go out for dinner or cocktails more often, and to take more vacations. Also, with more women joining the work force, families may increasingly find dining out a welcome convenience.

## Earnings

Hourly earnings of bartenders ranged from $4.68 to $7.48 in 1980, according to limited data from union contracts in the restaurant industry. Besides wages, bartenders may receive tips that substantially increase their earnings. Bartenders usually receive free meals at work and may be furnished bar jackets or complete uniforms.

The principal union organizing bartenders is the Hotel Employees and Restaurant Employees International Union (AFL-CIO).

## Related Occupations

Bartenders' duties include taking orders, serving drinks, and collecting payment from customers. Other workers who serve customers in a similar way include short-order cooks, food counter workers, and waiters and waitresses.

## Sources of Additional Information

Information about job opportunities may be obtained from local employers and the State emloyment service.

For a directory of colleges and other schools offering programs and courses in hospitality education, write to:

Council on Hotel, Restaurant, and Institutional Education, Human Development Building, Room 118, University Park, Pa. 16802.

# Cooks and Chefs

(D.O.T. 187.161-010, 313, and 315)

## Nature of the Work

A reputation for serving fine food is an asset to any restaurant or hotel, whether it prides itself on "home cooking" or exotic foreign cuisine. Cooks and chefs are largely responsible for the reputation a restaurant acquires. Although the terms "chef" and "cook" are often used interchangeably, the professional chef generally is a far more skilled, trained, and experienced person. Many chefs have earned fame for both themselves and the restaurants and hotels where they work because of their skill in artfully preparing the traditional favorites and in cre-

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ating new dishes and improving familiar ones.

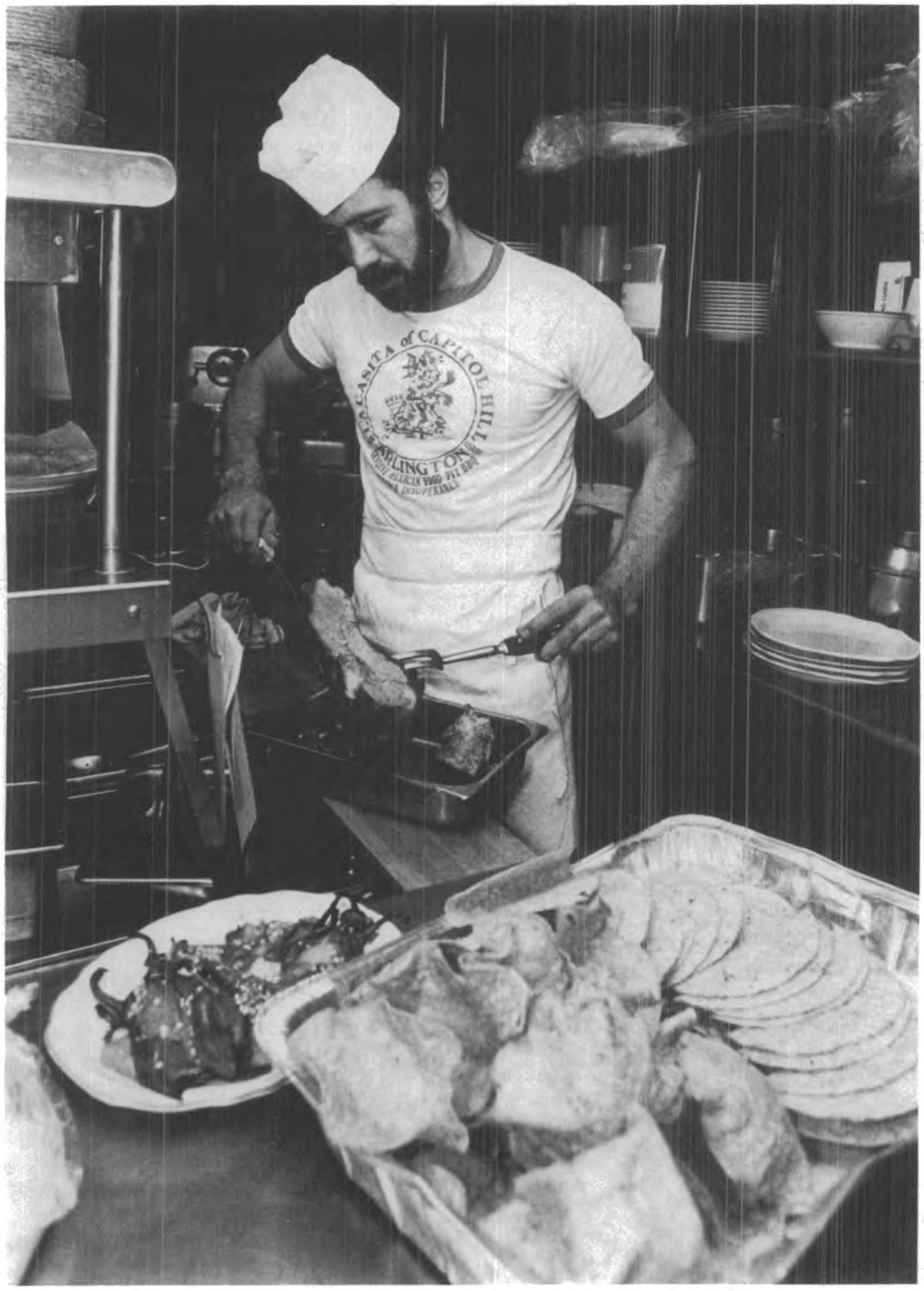
A cook's duties depend partly on the size and kind of restaurant. Smaller restaurants usually feature a limited number of easy-to-prepare, short-order specialties, and ready-made desserts. Typically, one cook prepares all of the food with the help of a short-order cook and one or two kitchen helpers.

Large eating places usually have more varied menus and prepare, from start to finish, more of the food they serve. Kitchen staffs often include several cooks, sometimes called assistant or apprentice cooks, and many kitchen helpers. Each cook usually has a special assignment and often a special job title—pastry, fry, or sauce cook, for example. Head cooks or chefs coordinate the work of the kitchen staff, and often direct certain kinds of food preparation. They decide the size of servings, sometimes plan menus, and buy food supplies.

## Working Conditions

Many kitchens have modern equipment, convenient work areas, and air-conditioning, but others, particularly in older and smaller eating places, are frequently marginally equipped. Other variations in working conditions depend on the type and quantity of food being prepared and the local laws governing food service operations. In most kitchens, however, cooks must stand most of the time, lift heavy pots and kettles, and work near hot ovens and ranges. Hours in restaurants may include late evening, holiday, and weekend work, while hours in offices, factories, or other institutions may be more regular. Cooks employed in public and private schools may work during the school year only, usually for 9 or 10 months.

Job hazards include falls, cuts, and burns, but injuries are seldom serious.



There are a number of ways to prepare for a career as a chef.

## Employment

About 1,100,000 cooks and chefs were employed in 1980. Most worked in restaurants and hotels, but many worked in schools, colleges, airports, and hospitals. Government agencies, factories, private clubs, and many other kinds of organizations also employed cooks and chefs.

## Training, Other Qualifications, and Advancement

Many cooks start work in an unskilled position such as kitchen helper and acquire their skills on the job; however, an increasing number are obtaining their training through high school, post-high school vocational programs, and community colleges. Cooks may also be trained in apprenticeship programs offered by professional associations and trade unions, or in a 3-year apprenticeship program administered by local offices of the American Culinary Federation in cooperation with local employers and junior colleges or vocational education institutions. In addition, some large hotels and restaurants operate their own training programs for new employees.

Only a short period of training or experience is required to become an assistant or fry cook, but many years of training and experience are necessary to achieve the level of skill required of an executive chef or cook in a fine restaurant. Even though a high school diploma is not required for beginning jobs, it is recommended for those planning a career as a cook or chef. High school or vocational school courses in business arithmetic and business administration are particularly helpful. To get experience, high school students can work part time in fast-food or other restaurants.

Persons who have had courses in commercial food preparation will have an advantage when looking for jobs in large restaurants and hotels, where hiring standards often are high. Some vocational programs in high schools offer this kind of training to students. But usually these courses, ranging from a few months to 2 years or more and open in some cases only to high school graduates, are given by trade schools, vocational centers, junior colleges, professional associations, and trade unions. The Armed Forces also are a good source of training and experience.

Although curricula may vary, students usually spend most of their time learning to prepare food through actual practice. They learn to bake, broil, and prepare food, and to use and care for kitchen equipment. Training programs often include courses in menu planning, determination of portion size, food cost control, purchasing food supplies in quantity, selection and storage of food, and use of leftovers. Students also learn hotel and restaurant sanitation and public health rules for handling food. Training in supervisory and

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management skills sometimes is emphasized in courses offered by private vocational schools, professional associations, and university programs.

Many school districts, in cooperation with school food services divisions of State departments of education, provide on-the-job training and sometimes summer workshops for cafeteria workers who wish to become cooks. Some junior colleges, State departments of education, and school associations also offer training programs. Cafeteria employees who have participated in these training programs often are selected for jobs as cooks.

Persons who want to become cooks or chefs should be able to work as part of a team and to withstand the pressure and strain of working in close quarters during busy periods. A keen sense of taste and smell, the physical stamina to stand for hours at a time, and personal cleanliness also are important qualifications. Most States require health certificates indicating that cooks and chefs are free from contagious diseases.

Advancement opportunities for cooks are better than for most other food service occupations. Many cooks acquire higher paying positions and new cooking skills by moving from one operation to another. Others gradually advance to chef positions or supervisory or management positions, particularly in hotels, clubs, or the larger, more elegant restaurants. Some eventually go into business as caterers or restaurant owners; others may become instructors in vocational programs in high schools, junior and community colleges, and other academic institutions.

## Job Outlook

Employment of cooks and chefs is expected to increase about as fast as the average for all occupations through the 1980's. In addition to an increase in demand for these workers, thousands of job openings will arise annually from the need to replace experienced workers who retire, die, or transfer to other occupations. Small restaurants, school cafeterias, and other eating places with simple food preparation will provide the greatest number of starting jobs for cooks.

The demand for cooks and chefs will increase as the population grows and people dine out more. Higher personal incomes and more leisure time will allow people to go out for dinner more often and to take more vacations. Also, with more women joining the work force, families may increasingly find dining out a welcome convenience.

## Earnings

In 1980, hourly pay rates ranged from $7.93 to $8.18 for chefs, from $4.89 to $7.28 for cooks of various types, and from $3.68 to $5.68 for assistant cooks, according to limited data from union contracts in several large metropolitan areas.

Wages of cooks and chefs vary depending on the part of the country and the type of establishment in which they work. Wages generally are higher in the West and in large, well-known restaurants and hotels. Cooks and chefs in famous restaurants earn much more than the above rates, and several chefs with national reputations earn more than $40,000 a year. Employers generally provide free meals and uniforms.

The principal union organizing cooks and chefs is the Hotel Employees and Restaurant Employees International Union (AFL-CIO).

## Related Occupations

Cooks and chefs may manage facilities ranging in size from a two-person sandwich shop to a large restaurant's or hotel's kitchen employing dozens of people. Other workers with similar management responsibilities include food service directors, executive housekeepers, and pursers. In addition, cooks and chefs in expensive restaurants create and then display a product to its best advantage. Other workers similarly involved include artists, bakers, clothes designers, and decorators.

## Sources of Additional Information

Information about job opportunities may be obtained from local employers and local offices of the State employment service.

General information about restaurant cooks and chefs is available from:

National Institute for the Foodservice Industry, 20 North Wacker Dr., Suite 2620, Chicago, Ill. 60606.

For information on the American Culinary Federation's apprenticeship program for cooks and chefs, write to:

American Culinary Federation, P.O. Box 3466, St. Augustine, Fla. 32084.

For a directory of colleges and other schools offering programs and courses in hospitality education, write to:

Council on Hotel, Restaurant, and Institutional Education, Human Development Building, Room 118, University Park, Pa. 16802.

# Food Counter Workers

(D.O.T. 311.137-010, .477-014, .674-010, .677-014; 319.474-010)

## Nature of the Work

Speed of service and accuracy in handling orders are the most important job skills for food counter workers. Typical duties include taking customers' orders, serving food and beverages, making out checks, and taking payments. At drugstore fountains and in diners, they also may cook, make sandwiches and cold drinks, and prepare sundaes and other ice cream dishes. In hamburger carryouts, where food is prepared in an assembly line manner, counter workers may take turns waiting on customers, making french fries, toasting buns, and doing other jobs.

Counter workers in cafeterias supply serving lines with desserts, salads, and other dishes, in addition to filling customers' plates with meats and side orders. Cafeterias usually employ central cashiers to take payments and make change.

Counter workers also do odd jobs, such as cleaning kitchen equipment, sweeping and mopping floors, and carrying out trash.

## Working Conditions

Since most counter workers are on duty less than 30 hours a week, some work only a few hours a day. Many others may work split breakfast-dinner shifts and have a few hours off in the middle of the day. This flexible schedule enables students to fit working hours around classes. Evening, weekend, and holiday work often is required.

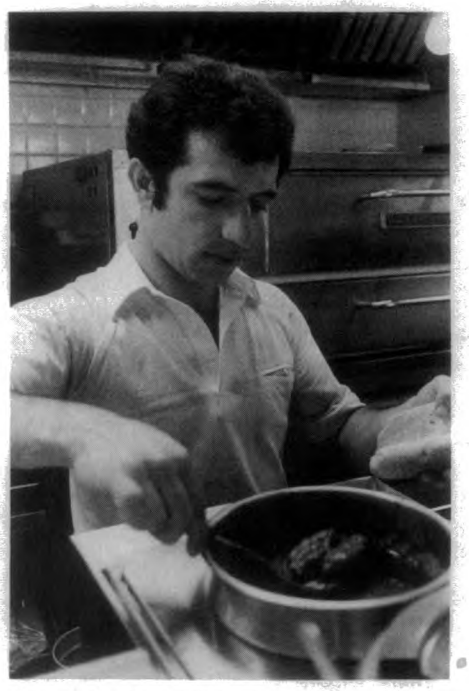
During busy periods, food counter workers must work quickly and effectively under pressure. The ability to function as a member of a team is important. Other job requirements include the ability to stand for long periods of time and to perform tasks within a restricted area. Unlike waiters and waitresses, food counter workers do not handle heavy trays, but are exposed to minor injuries from sharp implements or flatware, wet floors, or hot utensils or grease.

## Employment

Counter workers serve customers in eating places that specialize in fast service and inexpensive food, such as hamburger and fried chicken carryouts, drugstore soda fountains, and school and public cafeterias. Based on a Bureau of the Census survey, an estimated 426,000 persons, most of whom worked part time, had food counter jobs in 1980.

## Training, Other Qualifications, and Advancement

For counter jobs that require totaling bills



Most food counter workers learn their skills on the job.

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and making change, employers prefer to hire persons who are good in arithmetic and have attended high school, although a diploma usually is not necessary. Managers of fast-food restaurants often hire high school students as part-time counter workers. Counter jobs in cafeterias have no specific educational requirements.

Most counter workers learn their skills on the job by observing and working with more experienced workers. Some employers, including most fast-food restaurants, use self-study instructional booklets and audiovisual aids to train new employees.

Because counter workers deal with the public, a pleasant personality and neat and clean appearance are important. Good health and physical stamina also are needed to stand most of the time and work at a fast pace during busy periods. State laws often require counter workers to obtain health certificates to show that they are free of contagious disease.

Opportunities for advancement are limited in small eating places. Some counter workers move into higher paying jobs and learn new skills by transferring to a larger restaurant. Advancement can be to cashier, cook, waiter or waitress, counter or fountain supervisor, or, for counter workers in cafeterias, to line supervisor. Many large companies, such as the nationwide hamburger chains, operate formal management training programs, while others offer informal on-the-job training. Counter workers who are dependable and show leadership ability may qualify for these programs.

## Job Outlook

Job openings for food counter workers are expected to be plentiful in the years ahead. Most openings will result from the need to replace workers who find jobs in other occupations, retire, or die. Because many counter workers are students who work part time and leave the occupation after graduation, turnover is high.

Employment of counter workers is expected to increase faster than the average for all occupations through the 1980's, as population growth and rising personal incomes create more business for eating places. In addition, with more women joining the work force, families may increasingly find dining out a welcome convenience. Expansion of the restaurant industry, particularly the fast-food segment, will create many job openings. Thus, jobs should be relatively easy to find.

## Earnings

Hourly rates for food counter workers ranged from $2.47 to $4.15 in 1980, based on limited data from union contracts that covered eating places in several large cities. However, some counter workers, such as those in drugstores and diners, receive tips, which can be greater than hourly wages. Tips usually average between 10 and 20 percent of patrons' checks. Counter workers usually receive free meals at work and may be furnished with uniforms.

The principal union organizing food counter workers is the Hotel Employees and Restaurant Employees International Union (AFL-CIO).

## Related Occupations

Most food counter workers' duties include taking food orders, serving food and beverages, and collecting payments; often they are rushed to take care of customers. Other workers who have similar jobs include short-order cooks, waiters and waitresses, and bartenders.

## Sources of Additional Information

Information about job opportunities may be obtained from local employers and local offices of the State employment service.

For general information about food counter workers, write to:

National Institute for the Foodservice Industry, 20 North Wacker Dr., Suite 2620, Chicago, Ill. 60606.

# Meatcutters

(D.O.T. 316)

## Nature of the Work

Meatcutters prepare meat, fish, and poultry in supermarkets or wholesale food outlets. When the animal carcasses are shipped from a meatpacking plant or central distribution center, they are cut into quarters to facilitate handling. Meatcutters then divide the quarters into primal cuts, such as rounds, loins, and ribs, with a band saw. They use knives and saws to separate these large cuts into serving-size portions, such as steaks, roasts, and chops. Boneless cuts are divided by knives, slicers, or power cutters while band saws are used on bony pieces. Meat trimmings are ground into hamburger. Meatcutters also may prepare sausage and corned beef. In addition, meatcutters in retail foodstores may be required to stock meat display cases and assist customers.

## Working Conditions

Meatcutters work in coldrooms designed to prevent meat from spoiling. The low temperature, combined with the need to stand for long periods of time and lift heavy pieces of meat, demands physical strength and stamina. Meatcutters also must be careful when working with sharp tools, especially those that are powered.

Health and safety standards require clean and sanitary work areas.

## Employment

About 190,000 persons worked as meatcutters in 1980. Most worked in retail foodstores; the rest worked in wholesale stores, restaurants, hotels, hospitals, and other institutions. Jobs are located in almost every city and town in the Nation.

## Training, Other Qualifications, and Advancement

Most meatcutters acquire their skills on the job. Although many are informally trained, most learn through apprenticeship programs. A few meatcutters learn their skills by attending private schools specializing in this trade. However, graduates of these schools often need additional training and experience to work as meatcutters.

Generally, on-the-job trainees begin by doing odd jobs, such as removing bones and fat from retail cuts. Under the guidance of skilled meatcutters, they learn about the proper use of tools and equipment and how to prepare various cuts. After demonstrating skill with tools, they learn to divide quarters into primal cuts and to divide primal cuts into retail and individual portion items. Trainees may learn how to cut and prepare fish and poultry, roll and tie roasts, prepare sausage, and cure meat. Later, they may learn marketing operations such as inventory control, meat buying, and recordkeeping.

Meatcutters who learn the trade through apprenticeship programs generally complete 2 years of supervised on-the-job training that may be supplemented by classroom work. At the end of the training period, apprentices are given a meatcutting test which is observed by their employer. In union shops, a union member also is present during the exam. Apprentices who pass the test qualify as meatcutters. Those who fail the exam may repeat it at a later time. In some areas, apprentices may become meatcutters without completing the entire training program if they can pass the test.

Most employers prefer applicants who have a high school diploma and the potential to develop into meat department managers. Other skills important in meat cutting are manual dexterity, good depth perception, color discrimination, and good eye-hand coordination. A pleasant personality, a neat appearance, and the ability to communicate clearly are important qualifications when meatcutters wait on customers. Also, better-than-average strength is needed to lift heavy pieces of meat. A health certificate may be required for employment.

Meatcutters may progress to supervisory jobs, such as meat department managers in supermarkets. A few become meat buyers for wholesalers and supermarket chains. Some cutters become grocery store managers or open their own meat markets.

## Job Outlook

The number of meatcutters is expected to increase more slowly than the average for all occupations through the 1980's. Nevertheless, thousands of entry jobs will be available as experienced workers retire, die, or leave the occupation for other reasons.

Employment of meatcutters in food stores will be limited by central cutting—the practice of cutting and wrapping meat for several stores at one location. Central cutting, which

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Meatcutters must be careful when working with sharp tools.

permits meatcutters to specialize in both a type of meat and a type of cut, increases efficiency. In addition, more central cutting is expected to be done in meatpacking plants, thus reducing the amount of meat cut—and the need for meatcutters—in food stores.

## Earnings

Hourly earnings of meatcutters averaged $10.14 in 1980, according to a survey of union wage rates for grocery store employees in cities of 100,000 inhabitants or more. Meatcutters working in cities with 500,000 inhabitants or more generally earned more than those in smaller cities. Among grocery store occupations, meatcutters have the highest wages.

Beginning apprentices usually receive between 60 and 70 percent of the experienced cutter's wage and generally receive increases every 6 months.

Many cutters are members of the United Food and Commercial Workers International Union.

## Related Occupations

Meatcutters must be able to do both skilled hand and machine work and have some knowledge of processes and techniques involved in preparing food. Other occupations in food preparation which require similar skills are bakers, cooks, butchers of chicken and fish, and kitchen supervisors.

## Sources of Additional Information

Information about work opportunities can be obtained from local employers or local offices of the State employment service. For information on training and other aspects of the trade, contact:

United Food and Commercial Workers International Union, 1775 K St. NW., Washington, D.C. 20006.

# Waiters and Waitresses

(D.O.T. 311.137-014 through -022; .477-018 through -038; and .674-018)

## Nature of the Work

Whether they work in small lunchrooms or fashionable restaurants, all waiters and waitresses have jobs that are essentially the same. They take customers' orders, serve food and beverages, make out checks, and sometimes take payments. The manner in which waiters and waitresses go about their work may vary considerably, however. In diners, coffee shops, and other small restaurants, they are expected to provide fast, efficient service. In eating places where meals are served elaborately and a great deal of emphasis is placed on the satisfaction and comfort of each guest, waiters and waitresses serve food at a more leisurely pace and offer more personal service to their customers. For example, they may suggest wines and explain the preparation of items on the menu.

Depending on the type of restaurant, waiters and waitresses may perform duties other than waiting on tables. These tasks may include setting up and clearing tables and carrying soiled tableware to the kitchen. Although very small restaurants usually combine waiting on tables with counter service or cashiering, larger or more formal restaurants frequently relieve their waiters and waitresses of these additional duties.

## Working Conditions

Some waiters and waitresses work split shifts—that is, they work for several hours during the middle of the day, take a few hours off in the afternoon, and then return to their jobs for the evening hours. Most are expected to work on holidays and weekends. The wide range in dining hours creates a good opportunity for part-time work. Waiters and waitresses stand most of the time and often have to carry heavy trays of food. During dining hours, they may have to rush to serve several tables at once. The work is relatively safe, but they must be careful to avoid slips or falls and burns.

## Employment

About 1,700,000 waiters and waitresses were employed in 1980. A large proportion worked part time (less than 35 hours a week). Most worked in restaurants; some worked in hotels, colleges, and factories that have restaurant facilities. Jobs are located throughout the country but are most plentiful in large cities and tourist areas. Vacation

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Many waiters and waitresses are students who work part time.

resorts offer seasonal employment, and some waiters and waitresses alternate between summer and winter resorts instead of remaining in one area the entire year.

## Training, Other Qualifications, and Advancement

Most employers prefer to hire applicants who have had at least 2 or 3 years of high school. A person may start as a waiter or waitress, or advance to that position after working as a waiter's assistant, carhop, or food counter worker. Most waiters and waitresses pick up their skills on the job, learning to set tables, take orders from customers, and serve food in a courteous and efficient manner. At least 3 months' experience is preferred by larger restaurants and hotels. These larger operations also usually have higher educational standards. Some public and private vocational schools, restaurant associations, and large restaurant chains provide classroom training in a generalized food service curriculum. Other employers use self-instruction programs to train new employees. In these programs, an employee learns food preparation and service skills by observing film strips and reading instructional booklets.

Because people in this occupation are in close and constant contact with the public, a neat and clean appearance is important. Since waiters and waitresses must serve customers quickly and under pressure during busy periods, an even disposition is also important. Physical stamina also is necessary, as waiters and waitresses are on their feet for hours at a time, lifting and carrying trays of food from kitchen to table. Waiters and waitresses also should be good at arithmetic and, in restaurants specializing in foreign foods where some customers may not speak English, knowledge of a foreign language is helpful. State laws often require waiters and waitresses to obtain health certificates showing that they are free of contagious diseases.

Due to the small size of most food-serving establishments, opportunities for promotion in this specific area are limited. After gaining some experience, however, a waiter or waitress may transfer to a larger restaurant where earnings and prospects for advancement are better. Successful waiters and waitresses are those who genuinely like people, offer good service, and possess the ability to sell and make people feel comfortable rather than just take orders and deliver food. Advancement can be to cashier or supervisory jobs, such as host or hostess, maitre d'hotel, or dining room supervisor. Some supervisory workers advance to jobs as restaurant managers.

## Job Outlook

Job openings are expected to be plentiful in the years ahead, mainly due to the need to replace the waiters and waitresses who find other jobs or who retire, die, or stop working for other reasons. Turnover is particularly high among part-time workers. Many waiters and waitresses are students working part time who find other jobs after graduation. In addition to the job openings from turnover, many will result from growth in demand for these workers.

Employment of waiters and waitresses is expected to grow about as fast as the average for all occupations through the 1980's, as population growth and rising personal incomes create more business for restaurants. Higher incomes and more leisure time will permit people to dine out more often. Also, with more women joining the work force, families may increasingly find dining out a welcome convenience.

Beginners will find their best opportunities for employment in the thousands of informal restaurants. Those who seek jobs in expensive restaurants may find keen competition for the jobs that become available.

## Earnings

Hourly rates for waiters and waitresses (excluding tips) ranged from $2.04 to $3.64 in 1980, according to limited data from union contracts that covered eating and drinking places in several large cities. For many waiters and waitresses, however, tips are greater than hourly wages. Tips generally average between 10 and 20 percent of guests' checks. Most waiters and waitresses receive meals at work, and many are furnished with uniforms. The principal union organizing waiters and waitresses is the Hotel Employees and Restaurant Employees International Union (AFL-CIO).

## Related Occupations

Other workers whose jobs involve serving customers and helping them feel at ease and enjoy themselves include flight attendants, butlers, counter workers, hosts and hostesses, and bellhops.

## Sources of Additional Information

Information about job opportunities may be obtained from local employers and local offices of the State employment service.

General information on waiter and waitress jobs is available from:

National Institute for the Foodservice Industry, 20 North Wacker Dr., Suite 2620, Chicago, Ill. 60606.

# Waiters' Assistants and Kitchen Helpers

(D.O.T. 311.677 except -014; 312.687-010; and 318.687-010)

## Nature of the Work

Clean and attractive table settings are as important to a restaurant's reputation as the quality of food it serves. An egg-stained fork, a soiled tablecloth, or an empty salt shaker can make a customer unhappy. Waiters' assistants and kitchen helpers provide the quick hands and sharp eyes needed to prevent such problems.

Assistants do many jobs that otherwise waiters and waitresses would have to do. They clear and reset tables, carry soiled dishes to the dishwashing area, bring in trays of food, and clean up spilled food and broken dishes. By taking care of these details, assistants give waiters and waitresses more time to serve customers.

In addition, they may assist bartenders by keeping the bar supplied with liquor, mixes, and ice; stocking refrigerators with beer and wine; and replacing empty beer kegs with full ones. They also keep the area behind the bar clean and remove empty bottles and trash.

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Waiters' assistants help waiters and waitresses in some restaurants by serving water and bread and butter to customers. In addition, when business is light, they do various jobs such as refilling salt and pepper shakers and cleaning coffee pots.

In order to maintain an efficient and hygienic kitchen, kitchen helpers clean food preparation and storage areas, sweep and scrub floors, remove garbage, and separate trash. Other kitchen duties may include moving supplies and equipment from storage to work areas, performing some easy food preparation functions, and washing pots and pans used in cooking. They also furnish a support system for the dining room staff by scraping food from plates, stacking them in the dishwasher, cleaning silver flatware, and removing water spots from glassware.

## Working Conditions

Most assistants and kitchen helpers work less than 30 hours a week. Some are on duty only a few hours a day during either the lunch or dinner period. Others work both periods but may take a few hours off in the middle of the day. Weekend and holiday work often is required.

Job hazards include the possibility of falls, cuts, and burns, but injuries are seldom serious. The work is strenuous, however, since these workers have to lift heavy trays filled with dishes, and large pots and pans.

## Employment

About 280,000 assistants and 840,000 kitchen helpers were employed in 1980. Most worked only part time.

Most assistants and kitchen helpers work in restaurants, bars, and hotels. Kitchen helpers also work in schools, hospitals, and other institutional dining operations.

## Training, Other Qualifications, and Advancement

A high school education is not needed to qualify for jobs as waiters' assistants and kitchen helpers, and many employers will hire applicants who do not speak English. Assistants and kitchen helpers must be in good physical condition and have physical stamina because they stand most of the time, lift and carry trays, and work at a fast pace during busy periods. State laws often require them to obtain health certificates to show that they are free of contagious diseases. Because of their close contact with the public, assistants should be neat in appearance, have good personal hygiene, and get along well with people.

Promotions for waiters' assistants and kitchen helpers are limited. Assistants sometimes advance to positions as waiter or waitress, and kitchen helpers occasionally advance to cook's helper or short-order cook. The ability to read, write, and do simple arithmetic is required for promotion. Opportunities for advancement generally are best in large restaurants and institutions.

## Job Outlook

Job openings for waiters' assistants and kitchen helpers are expected to be plentiful in the years ahead. Many openings will result from the need to replace workers who find jobs in other occupations, retire, or die. Turnover is particularly high among part-time workers. Many assistants and kitchen helpers are students who work part time while attending school.

Additional openings will result from an increase in demand for these workers. Employment of waiters' assistants and kitchen helpers is expected to increase faster than the average for all occupations through the 1980's as population growth, higher incomes, and more leisure time create more business for restaurants. With more women joining the work force, families may increasingly find dining out a welcome convenience.

## Earnings

Waiters' assistants and kitchen helpers have relatively low earnings. Limited data from union contracts that cover restaurants and bars in several large cities indicate that hourly rates for waiters' assistants ranged from $3.00 to $3.76 in 1980, while kitchen helpers earned from $3.35 to $4.90 an hour. In addition to wages, however, assistants may receive a percentage of waiters' and waitresses' tips. Employers usually furnish uniforms and a free meal.

The principal union organizing waiters' assistants and kitchen helpers is the Hotel Employees and Restaurant Employees International Union (AFL-CIO).

## Related Occupations

Other jobs which require little formal education but provide comfort and convenience to people are bell captains, building custodians, waiters and waitresses, hospital attendants, and porters.

## Sources of Additional Information

Information about job opportunities may be obtained from local employers and local offices of the State employment service.

For general information about waiters' assistants and kitchen helpers, write to:

National Institute for the Foodservice Industry, 20 North Wacker Dr., Suite 2620, Chicago, Ill. 60606.

Job openings for waiters assistants are plentiful.

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# Health Service Occupations

The workers described in this section of the *Handbook* assist health professionals such as physicians, dentists, optometrists, nurses, and therapists. They typically perform routine but essential tasks that involve a great deal of personal contact: Conversing with patients, making them comfortable, and setting them at ease. Depending on their place of work, health service workers might make appointments, greet patients, keep records, set up equipment, deliver food trays, change bed linen, transport patients, help them do exercises, and escort those who cannot walk unassisted.

Relatively little specialized training is required for most of these jobs, although some workers prepare by completing 1- or 2-year programs offered by community colleges, vocational-technical institutes, and trade schools. Employers generally provide all the necessary training right on the job. While high school graduates are preferred, employers do not always insist on a diploma. More important are the personal traits these jobs require: Dependability, common sense, emotional stability, a cheerful disposition, and willingness to assume responsibility. A fair amount of physical effort is involved, and at times the work is strenuous and tiring.

*Nurses aides and orderlies* make up the largest of these occupations; nearly 1.2 million were employed in hospitals, nursing homes, and rehabilitation centers in 1980. Much of the workday is spent answering patients' bell calls, delivering and collecting food trays, feeding patients, and relieving the nursing staff of other routine tasks. More than 82,000 *psychiatric aides* were employed in 1980. Most work in mental hospitals, where they help patients with bathing, dressing, grooming, and meals. *Ambulance drivers* and *ambulance attendants* also provide essential services.

At least 275,000 persons were employed in medical or dental assisting occupations in 1980. Assistants usually work in the office of a practitioner, and the job involves a combination of office and patient-care duties. Optometric assistants, for example, give preliminary eye examinations and help patients do prescribed exercises. Approximately 140,000 *dental assistants*, 90,000 *medical assistants*, and 18,000 *optometric assistants* were employed in 1980. Other assisting jobs include those of *chiropractor assistant* and *podiatric assistant*.

Therapists, like other health practitioners, often work with the support of *assistants* and *aides*. The different job titles reflect different levels of training and expertise. Assistants have more formal preparation than aides; many are graduates of 2-year associate degree programs. About 11,500 *physical therapist assistants* and 8,500 *occupational therapy assistants* were employed in 1980. Assistants help the therapist test patients and administer treatments. Aides are less directly involved in diagnosis and treatment. Instead, they help patients dress and undress, organize and maintain the equipment, make appointments, and perform other clerical duties.

Employment in these occupations is expected to grow faster than the average for all occupations through the 1980's. This reflects anticipated demand for health care services on the part of a growing and aging population, and continued emphasis on using auxiliary personnel to extend the care delivered by highly trained practitioners. Most job openings, however, will result from replacement needs, which will continue to be substantial. Turnover in these occupations tends to be very high, in part because entry requirements are minimal and pay scales are low. Job prospects differ among these health service occupations, however; see the *Handbook* statements that follow for information on the outlook in specific occupations.

## Dental Assistants

(D.O.T. 079.371-010)

### Nature of the Work

Dental assistants work with dentists as they examine and treat patients. The assistant makes the patients comfortable in the dental chair, prepares them for treatment, and obtains their dental records. The assistant hands the dentist the proper instruments and materials and keeps the patient's mouth clear by using suction or other devices. Dental assistants prepare materials for making impressions and restorations, and expose radiographs and process dental X-ray film as directed by the dentist. They sterilize and disinfect instruments and equipment; prepare tray set-ups for dental procedures; provide post-operative instruction; and instruct patients in oral health practices.

Dental assistants may perform a variety of laboratory, clinical, and office duties. Some assistants make casts of the teeth and mouth from impressions taken by the dentist. In some States, assistants apply medications to the teeth and oral tissue, remove excess cement used in the filling process, and place rubber dams on the teeth to isolate them for individual treatment. Some dental assistants manage the office and arrange and confirm appointments, receive patients, keep treatment records, send bills, receive payments, and order dental supplies and materials.

The work of the dental assistant should not be confused with that of the dental hygienist, who must be licensed to scale and polish the teeth. (See the statement on dental hygienists elsewhere in the *Handbook*.)

### Working Conditions

Dental assistants work in a well-lighted, clean environment. They must be careful in handling radiographic and other equipment. Dental assistants, like dentists, work in either a standing or sitting position. Their work area is near the dental chair, so that they can arrange instruments, materials, and medication, and hand them to the dentist when needed. They must be a dentist's "third hand," and therefore should exhibit some manual dexterity and be able to deal with people who may be under stress.

### Employment

Nearly 140,000 persons worked as dental assistants in 1980; about 1 out of 10 worked part time.

Most dental assistants work in private dental offices, either for individual dentists or for groups of dentists. Many of the remainder work in dental schools, hospital dental departments, State and local public health departments, or private clinics. The Federal Government employs dental assistants in hospitals and dental clinics of the Public Health Service, the Veterans Administration, and the Armed Forces.

### Training, Other Qualifications, and Advancement

Most dental assistants learn their skills on the job. An increasing number, however, are trained in dental assisting programs offered by community and junior colleges, trade schools, and technical institutes. About 300 such programs were accredited by the Commission on Dental Accreditation in 1980. More than three-fourths of the programs take 1 year to complete and lead to a certificate or diploma. Graduates of 2-year programs offered in community and junior colleges earn an associate degree. The minimum requirement for any of these programs is a high school diploma or its equivalent. Some schools also require typing or a science course for admission. Some private vocational schools offer 4- to 6-month courses in dental assisting, but these are not accredited by the dental profession. Those receiving dental assistant training in the Armed Forces usually qualify for civilian jobs as dental assistants.

High school students interested in careers as dental assistants should take courses in biology, chemistry, health, typing, and office practices.

Approved dental assisting curriculums include classroom, laboratory, and preclinical



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instruction in dental assisting skills and related theory. In addition, students gain practical experience in affiliated dental schools, local clinics, or selected dental offices.

A correspondence course offered by the University of North Carolina School of Dentistry is among those programs accredited by the American Dental Association. This course is available for employed dental assistants who are learning on the job or who otherwise are unable to participate in accredited training programs on a full-time basis. The correspondence program is equivalent to 1 academic year of study but generally requires about 2 years to complete.

Graduates of accredited dental assistant programs who successfully complete an examination administered by the Dental Assisting National Board, Inc. become Certified Dental Assistants. Certification is acknowledgment of an assistant's qualifications but is not generally required for employment.

After working as dental assistants, some individuals seek to acquire skills and qualifications for practicing as dental hygienists. Prospective dental assistants who foresee this possibility should plan carefully, since credit earned in a dental assistant program often is not applicable toward requirements for a dental hygiene certificate. Some dental assistants become sales representatives for firms that manufacture dental products. The field of dental assisting education offers opportunities in teaching and program administration.

Dental assistants serve as a dentist's "third hand".

## Job Outlook

Employment opportunities for dental assistants are expected to be excellent through the 1980's. Part-time opportunities also will continue to be very favorable.

Employment of dental assistants is expected to grow faster than the average for all occupations, largely because dental students are being taught to use assistants in their practice. The increase in population, a growing awareness of the importance of regular dental care, and the public's increasing ability to pay for care also will contribute to the demand for dental assistants. Participation in dental prepayment plans, for example, brings dental services within the reach of many who could not afford them otherwise.

In addition to job openings created by growth in the demand for dental services, many dental assistants will be required each year to replace those who leave the field.

## Earnings

Salary depends largely on the duties and responsibilities attached to the particular job and geographic location. Dentists' policies with respect to assistants' salaries vary widely, but there is little evidence that individuals who have completed a formal training program in dental assisting command higher pay.

In 1980, most dental assistants working for dentists in private practice earned between $9,000 and $11,000 annually, based upon the limited information available. A few earned up to $15,000 or more a year depending upon the size of the office and the responsibilities performed by these key personnel.

In the Federal Government, experience and the amount and type of education determine entrance salaries. In 1981, a high school graduate who had 6 months of general experience started at nearly $9,800 a year; graduates of an ADA-approved 1-year training program who had an additional year of general experience could expect to start at nearly $11,000 a year. In general, experienced dental assistants working for the Federal Government in 1980 earned average annual salaries of about $11,800.

Although the 40-hour workweek prevails for dental assistants, the schedule is likely to include work on Saturday. A 2- or 3-week paid vacation is common. Some dentists provide sick leave and other benefits. Dental assistants who work for the Federal Government receive the same employee benefits as other Federal workers.

## Related Occupations

Dental assistants perform a variety of duties that do not require the dentist's professional knowledge and skill. Other workers who provide similar services under the supervision of a medical practitioner include medical assistants, chiropractor assistants, optometric assistants, podiatric assistants, and surgical technicians.

## Sources of Additional Information

Information about career opportunities, scholarships, accredited dental assistant programs, including the correspondence program, and requirements for certification is available from:

American Dental Assistants Association, 666 N. Lake Shore Dr., Suite 1130, Chicago, Ill. 60611.

Commission on Dental Accreditation, 211 E. Chicago Ave., Chicago, Ill. 60611.

Dental Assisting National Board, Inc., 666 N. Lake Shore Dr., Suite 1136, Chicago, Ill. 60611.

# Medical Assistants

(D.O.T. 079.367-010)

## Nature of the Work

Medical assistants help physicians examine and treat patients and perform most of the administrative tasks needed to keep an office running smoothly.

The duties of medical assistants, who sometimes are called *medical office assistants*, consist of clerical and clinical activities. The size of the office in which the medical assistant works determines the scope of the job: Those in small offices typically handle both clerical and clinical duties,

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whereas in offices with a sizable staff, medical assistants usually specialize in either the "office" or "patient care" aspects of the job.

Clinical duties most commonly include: Recording patients' height, weight, temperature, and blood pressure; obtaining medical histories; performing simple laboratory tests; preparing patients for examination or treatment; helping the physician examine patients; and cleaning and sterilizing instruments. Other clinical duties may be instructing patients about medication and self-treatment, and applying dressings.

Medical assistants also may arrange instruments and equipment in the examining room; check office and laboratory supplies; and maintain the waiting, consulting, and examination rooms in a neat and orderly condition.

Medical assistants perform a variety of clerical jobs. They may answer the telephone, greet patients and other callers, record and file patient data and medical records, fill out medical and insurance forms, handle correspondence, schedule appointments, and arrange for hospital admission and laboratory services. Along with other office duties, they may transcribe dictation and handle the bookkeeping and billing. Medical secretaries and medical receptionists also perform clerical tasks in medical offices, but unlike medical assistants, they rarely have clinical duties. (See the statements on receptionists and on secretaries and stenographers elsewhere in the *Handbook*.)

## Working Conditions

Medical assistants work in a well-lighted, clean environment. Because they assist physicians with physical examinations, medical assistants must have some manual dexterity, and they must be able to deal with people who may be under stress.

## Employment

About 90,000 persons worked as medical assistants in 1980. About 85 percent worked in the offices of physicians in private practice. Some worked in health maintenance organizations, clinics, nursing homes, and hospitals.

## Training, Other Qualifications, and Advancement

Medical assistants typically are trained on the job by the physicians who employ them. However, an increasing number have attended one of the formal training programs available in public or private vocational schools and in community or junior colleges. Applicants for either on-the-job or formal training in medical assisting usually need a high school education or the equivalent. High school courses in mathematics, health, biology, typing, bookkeeping, and office practices are helpful.

Most community college programs in medical assisting last 2 years and lead to an associate degree; the other programs take up to 1 year to complete and graduates receive a diploma. Graduates from all kinds of medical assisting programs totaled almost 20,000 in 1980. Not all sought work as medical assistants after graduation, however. Every year, many graduates enter other fields of employment and some pursue training in nursing, medical technology, or other allied health fields.

Two agencies are recognized by the U.S. Department of Education to accredit programs in medical assisting: The Committee on Allied Health Education and Accreditation (CAHEA) and the Accrediting Bureau for Health Education Schools (ABHES). The 141 programs currently approved by CAHEA graduated about 5,100 students in 1980. The ABHES currently accredits 81 programs, and graduates numbered about 3,400 in 1980. The curriculum in these programs consists of courses in biology, anatomy and physiology, typing, transcription, accounting, records and recordkeeping, and medical terminology. Students also receive supervised clinical experience and learn laboratory techniques, use of medical machines, administrative and clinical procedures, and office practices.

The American Association of Medical Assistants (AAMA) awards the title of Certified Medical Assistant (CMA) to medical assistants who pass the required written examination. One may qualify to take the examination by: (1) Completing a CAHEA-approved program in medical assisting; (2) having a high school diploma or equivalent and showing evidence of 1 year's experience as a medical assistant working under the supervision of a physician; or (3) showing proof of 5 years' experience as a medical assistant working for a physician. Certification is not a license and is not required for AAMA membership; however, physicians usually consider CMA's to be highly qualified.

Another distinction in this field is the title Registered Medical Assistant (RMA). The American Medical Technologists award the RMA to those who meet their qualifications and pass the qualifying examination. To take the RMA examination, a medical assistant must have completed high school or the equivalent and have completed an ABHES-accredited program, an associate degree program, or, some other acceptable combination of education and experience as outlined in the American Medical Technologists test guidelines. The RMA is a recognition of competence.

Advancement opportunities for medical assistants are limited, although competent medical assistants with leadership abilities may rise to the position of office manager. As a rule, however, advancement to other health occupations requires additional formal training.

A neat, well-groomed appearance and a courteous, pleasant manner are necessary traits for medical assistants, who have a great deal of contact with the public. Communication skills are especially important. Medical assistants must not only be good at putting patients at ease, but careful enough listeners to interpret a physician's instructions correctly the first time they are given. Conscientiousness, a sense of responsibility, and respect for the confidential nature of medical information are all valuable qualities in a medical assistant. Clinical duties require a reasonable level of manual dexterity.

## Job Outlook

Employment opportunities for medical assistants, particularly for graduates of accredited training programs, are expected to be excellent through the 1980's.

Employment of medical assistants is expected to grow faster than the average for all occupations because of the projected rapid increase in the number of physicians in patient care. The growing complexity of medical services, combined with the increasing volume of paperwork, also will contribute to the demand for medical assistants.

The need for more medical assistants also is related to the rising demand for medical care in general. This demand results from a growing population, an increasing number of older people (who generally require more medical attention), and the widespread ability of patients to purchase medical care because of coverage under private health insurance plans, Medicare, and Medicaid.

In addition to openings resulting from increased demand for medical assistants, many jobs will become available each year because of replacement needs, which are substantial.

## Earnings

The earnings of medical assistants can vary widely. The assistant's experience and the physician's practice volume and geographic location all help to determine the level of pay. From the limited information available, inexperienced medical assistants generally start at the minimum wage, or about $125 to $150 a week and most medical assistants earn less than $10,000 a year.

Although medical assistants usually work 40 hours per week, some work on Saturday may be required.

## Related Occupations

Other health occupations that entail a combination of clerical and clinical duties, and require only a limited amount of specialized training, include pharmacy helpers, dental assistants, optometric assistants, podiatric assistants, occupational therapy aides, and physical therapist aides.

## Sources of Additional Information

Information about career opportunities, CAHEA-accredited educational programs in medical assisting, and requirements for the CMA is available from:

The American Association of Medical Assistants, 1 East Wacker Dr., Suite 2110, Chicago, Ill. 60601.

Information about career opportunities and requirements to become an RMA are available from:

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American Medical Technologists, Medical Assistant Program, 710 Higgins Rd., Park Ridge, Ill. 60068.

For a list of ABHES-approved educational programs in medical assisting, write:

Accrediting Bureau of Health Education Schools, Oak Manor Office, 29089 U.S. 20 West, Elkhart, Ind. 46514.

A list of accredited and nonaccredited postsecondary programs in medical assisting, arranged by State, may be found in *Programs and Schools, A Supplement to the Directory of Postsecondary Schools with Occupational Programs, 1978,* a publication of the U.S. Department of Education's National Center for Education Statistics. This publication and similar directories put out by commercial publishers may be available in counseling centers or large public libraries.

# Occupational Therapy Assistants

(D.O.T. 076.364-010)

## Nature of the Work

Occupational therapy assistants do much of the routine work that a rehabilitation program entails. Working under the supervision of occupational therapists, they are members of the health team in the rehabilitation of patients impaired by physical, mental, or developmental problems. (See the statement on occupational therapists elsewhere in the *Handbook*.)

Occupational therapy assistants help occupational therapists plan and carry out educational, vocational, and recreational activities aimed at helping patients regain the use of those capacities that remain after accident, disease, or deformity. They teach clients self-care skills such as dressing, eating, and shaving; work-related skills such as the use of power tools; and recreational and social activities such as games, dramatics, and gardening. They also may teach creative skills such as woodworking, ceramics, and graphic arts.

Since they work very closely with patients, occupational therapy assistants observe them and make reports to the occupational therapist on the patients' progress and development. In addition, occupational therapy assistants perform many other tasks such as ordering, preparing, and laying out materials; helping to make splints, braces, and other assistive devices; and maintaining tools and equipment, such as woodworking, ceramics, and graphic arts tools.

Assistants must be able to teach a broad range of skills because of the wide variety of patients. They may work either with groups or with individual patients. When treating patients with diseases, assistants usually work closely with occupational therapists. In other situations, such as organizing crafts projects for handicapped persons living in institutions, they may function independently, with only periodic consultation with professionals.

Some small occupational therapy departments may consist only of a therapist and one other worker. In these cases, the assistant may assume some of the duties of an occupational therapist, within the limits of his or her training.

## Working Conditions

Although occupational therapy assistants generally work a standard 40-hour week, they may occasionally have to work evenings and weekends. The areas where they work generally are well lighted and ventilated, although noise levels often are high in areas where power tools are being used. Job duties can be physically tiring because assistants are on their feet much of the time and may have responsibility for cleaning equipment.

## Places of Employment

An estimated 8,500 people worked as occupational therapy assistants in 1980. Most worked in hospitals or nursing homes; the remainder worked in a variety of facilities, including clinics, community mental health centers, vocational rehabilitation programs, schools for handicapped children and the mentally retarded, rehabilitation centers, and adult day care centers.

## Training, Other Qualifications, and Advancement

Two types of educational institutions train occupational therapy assistants: Community colleges and vocational and technical schools. In 1980, 47 schools offered educational programs approved by the American Occupational Therapy Association. Most of these are community college programs that last 2 years and lead to an associate degree. Just one is a 1-year vocational or technical school program. In addition, the Armed Forces train occupational therapy assistants.

Graduates of these programs who successfully complete the written national proficiency examination are certified by the American Occupational Therapy Association and receive the title Certified Occupational Therapy Assistant (COTA). In 1980, about 5,000 employed occupational therapy assistants were COTA's.

Approved programs combine classroom instruction with at least 2 months of supervised practical experience. Courses include the history and philosophy of occupational therapy, occupational therapy theory and skills, anatomy and physiology of the human body, the effect of illness and injury on patients, and human development. Students also practice skills and crafts they later will teach to patients.

Applicants for training programs must be high school graduates or the equivalent. Among the subjects recommended for high school students interested in the occupational therapy field are health, biology, typing, and the social sciences. Preference sometimes is given to applicants who have taken courses in science and crafts and have previous work experience in a health care setting.

Occupational therapy assistants should like people, have good physical and mental health, and be able to establish and maintain effective interpersonal relationships. They also should have manual skills because they must teach clients how to use tools and materials.

Occupational therapy assistants who work in large health facilities begin with routine tasks and may advance to more responsible ones as they gain experience. A COTA with

Occupational therapy assistant helps patient do routine exercises to regain use of hand.

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4 years of approved work experience may take the examination to become a registered occupational therapist (OTR) without completing the remaining 2 years of study for a bachelor's degree in occupational therapy. Those COTA's considering this path of entry to the occupational therapy profession should contact the Director of Credentialing of the American Occupational Therapy Association to identify the types of experience required to qualify for the examination.

## Job Outlook

Employment of occupational therapy assistants is expected to grow much faster than the average for all occupations through the 1980's in response to continued support for rehabilitation programs. Hospitals and nursing homes in particular will need additional occupational therapy assistants to meet the heightened demand for rehabilitation services on the part of a growing and aging population. Furthermore, because turnover is relatively high, many openings for assistants will arise because of replacement needs.

Job opportunities for occupational therapy assistants who are graduates of approved programs are expected to be favorable through the 1980's. Although enrollments in occupational therapy assistant training programs are rising, the supply of graduates is likely to fall short of requirements.

## Earnings

In 1980, starting salaries for occupational therapy assistants generally ranged from about $11,000 to $13,000 a year. Experienced assistants earned between $12,000 and $17,500 a year, according to the limited information available. Occupational therapy assistants working for the Federal Government earned starting salaries of about $9,800 annually in 1980. The average salary paid occupational therapy assistants with the Federal Government was about $14,200 a year.

## Related Occupations

Occupational therapy assistants help administer occupational therapy programs under the supervision of an occupational therapist. Other workers with similar auxiliary duties include orthotic assistants, physical therapist assistants, and prosthetics assistants.

## Sources of Additional Information

For information about work opportunities and programs offering training for occupational therapy assistants, contact:

American Occupational Therapy Association, 1383 Piccard Dr., Rockville, Md. 20850.

Those COTA's interested in qualifying for the examination to become a registered occupational therapist (OTR) through acquired work experience should contact the Director of Credentialing, American Occupational Therapy Association, at the above address.

# Optometric Assistants

(D.O.T. 079.364-014)

## Nature of the Work

Optometric assistants, also known as *paraoptometrics*, perform a combination of clerical and patient care tasks, enabling optometrists to devote more time to their professional duties. The duties of an assistant vary from office to office, depending on the employing optometrist's style of practice. They may keep patients' records, schedule appointments, and handle bookkeeping, correspondence, and filing. They may prepare patients for eye examinations, take initial case histories, and record the results of optometrists' examinations. Other duties are of a more technical nature. For instance, assistants may measure patients for correct and comfortable fit of glasses. They may suggest size and shape of eyeglass frames to complement the patient's facial features, and may adjust finished eyeglasses by heating, shaping, and bending the plastic or metal frames. They also may assist the optometrist by teaching the patient how to wear and care for contact lenses.

Optometric assistants may help patients with vision therapy activities to develop eye coordination, focusing, and other visual abilities. In the laboratory, they may adjust conventional glasses to assure proper fit, insert lenses in frames, repair frames, keep an inventory of optometric materials, order supplies, and clean and care for the instruments.

In a large practice or a clinic, assistants are likely to specialize—in laboratory work, contact lenses, visual training, chairside assistance, or office administration. In a smaller practice, one assistant may perform all these duties.

Different levels of paraoptometrics are beginning to emerge. Workers known as *optometric technicians* have more extensive training—and may assume more complex duties—than optometric assistants. Technicians might measure the curvature of the cornea; test the patient's ability to see numbers or letters at a specified distance; and record pressures or tensions within the eye.

## Working Conditions

Optometric assistants and technicians work in clean, well-lighted, and pleasant surroundings. Although their work is not physically demanding, they must be on their feet part of the time. Attention to detail is necessary.

Most optometric assistants work between 30 and 40 hours a week. In many practices, the assistant may work a few hours on Saturday, with a day off during the week. Some evening work may be required.

## Employment

According to the American Optometric Association, about 18,000 persons worked as optometric assistants or technicians in 1980; most were assistants. Most were employed by optometrists in private practice. Some, however, worked for health clinics, health maintenance organizations, and optical companies. Others served as assistants to optometrists in the Armed Forces. Some worked part time.

## Training, Other Qualifications, and Advancement

Most of these workers are trained on the job. Training also can be acquired in 1- and 2-year programs offered by community colleges, technical institutes, and colleges of optometry. Optometric assisting is taught in 1-year courses; 10 schools offered this type of training in 1980. Optometric technicians undergo more extensive training, available in 17 schools in 1981 that offer 2-year courses leading to an associate degree. The Council on Optometric Education of the American Optometric Association accredits technician programs; currently 8 programs are accredited. In addition, the U.S. Air Force trains optometric specialists in an accelerated, 16-week program.

High school graduation or its equivalent, including courses in English, mathematics, and office procedures, is preferred for formal or on-the-job training. All formal programs offer specialized courses such as the anatomy and physiology of the human eye, vision training (the use of exercises to correct defective vision), and contact lens theory and practice. Programs also include secretarial and office procedures. Lectures and laboratory work are supplemented by experience in optometric clinics and practices.

Paraoptometric personnel with the proper combination of training and experience can take an exam to become registered with the National Paraoptometric Registry as Registered Optometric Assistants (Opt. A., R.) or Registered Optometric Technicians (Opt. T., R.), respectively.

Manual dexterity and accuracy are requirements for persons planning to work in this field. The ability to follow routines and procedures is needed. Because of the person-to-person relationship between paraoptometrics and patients, a neat appearance, courtesy, and tact are important.

## Job Outlook

Employment of optometric assistants and technicians is expected to grow faster than the average through the 1980's, due to the rising demand for eye care services and more widespread use of auxiliary personnel by optometrists. Demand for eye care is expected to increase due to population growth and to the rising proportion of older persons, that segment of the population requiring the most

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Most optometric assistants are trained on the job.

eye care. The number of support personnel employed by optometrists is rising because of the tendency on the part of younger, newly graduated optometrists to hire auxiliaries. This in turn reflects the current emphasis in colleges of optometry on encouraging the utilization of auxiliary personnel in optometric practice.

In addition to job openings resulting from increased demand for these workers, many openings will occur because of the need to replace workers who transfer to other kinds of work, retire, or die. Turnover is relatively high.

Employment opportunities for graduates of formal training programs should be excellent. Indeed, in communities where such programs have been established, persons without formal training may face competition. Most job openings, however, will be filled by people without formal training. Employers generally hire high school graduates, and view favorably previous work experience in an office or in another health-related occupation. Jobseekers will continue to find many opportunities for part-time work, some of which will be in the evenings or on Saturdays.

## Earnings

Earnings of paraoptometric personnel vary by geographic region, academic and technical qualifications, and the size and type of practice of the optometrists employing them. In 1980, beginning salaries for optometric assistants generally were between $6,000 and $8,000 a year, while starting optometric technicians were paid starting salaries of between $7,000 and $14,000.

## Related Occupations

Other workers who assist medical professionals are chiropractor assistants, dental assistants, occupational therapy assistants, office nurses, orthopedic assistants, physical therapist assistants and aides, podiatric assistants, and psychiatric aides.

## Sources of Additional Information

Career information, a list of programs that offer training for optometric assistants and optometric technicians, and information on the National Paraoptometric Registry are available from:

American Optometric Association, Paraoptometric Section, 243 North Lindbergh Blvd., St. Louis, Mo. 63141.

# Physical Therapist Assistants

(D.O.T. 076.224-010)

## Nature of the Work

Physical therapist assistants work under the supervision of qualified physical therapists to treat disabled persons so that they may lead useful and productive lives. Treatment helps to restore physical functions and prevent permanent disability from injury or illness. Their patients include accident victims, handicapped children, and stroke victims. Physical therapy is also used in the treatment of multiple sclerosis, cerebral palsy, nerve injuries, amputations, fractures, and arthritis. (See the statement on physical therapists elsewhere in the *Handbook*.)

Physical therapist assistants generally work with patients who have relatively stable conditions. They use a variety of treatment techniques, such as exercises; massage; heat, light, sound, water, electrical and infrared treatments; and hot or cold packs. Assistants instruct and help patients to learn or improve their ability to walk, climb, and move from one location to another and to acquire skills needed for daily living. They observe patients during treatment to gather information on their responses and progress and report findings to the physical therapist, either orally or in writing. They also instruct patients in the use and care of artificial limbs, braces, and other devices such as crutches, canes, walkers, and wheelchairs.

## Working Conditions

Physical therapist assistants may be required to work some evenings and weekends. Although they work in clean and pleasant surroundings, the work can be physically exhausting. They are on their feet for hours at a time, and lift patients into and out of wheelchairs, position them on treatment tables, and help them stand or walk. In addition, they may have to move heavy equipment.

## Employment

An estimated 11,500 persons worked as physical therapist assistants in 1980. Most worked in physical therapy departments of hospitals. Others worked in physicians' or physical therapists' offices, clinics, rehabilitation centers, nursing homes, and other long-term care facilities. Some community and government health agencies, schools for handicapped children, and facilities for the mentally retarded also employ physical therapist assistants.

## Training, Other Qualifications, and Advancement

Training requirements for physical therapist assistants are not uniform throughout the country. Physical therapist assistants are licensed in 24 States, where they must be graduates of an accredited 2-year associate degree program and may have to pass a written licensure examination.

There were 58 accredited programs to train physical therapist assistants in 1980. Most were in community colleges, and all led to an associate degree. Courses include history and philosophy of rehabilitation, human growth and development, anatomy, physiology, and psychology. Studies also cover physical therapist assistant procedures including mas-

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Physical therapist assistants may work with very young patients.

sage, therapeutic exercise, and heat and cold therapy. Supervised clinical experience also is a requirement of physical therapist assistant programs. The Armed Forces operate schools to train physical therapist assistants, but this training does not satisfy academic requirements for State licensure and no degree is awarded to graduates.

High school courses helpful to physical therapist assistants are health, biology, social science, physical education, mathematics, and typing.

Physical therapist assistants should be in good physical condition. They also need manual dexterity to adjust equipment, body coordination to assist patients, and an interest in assisting the physically handicapped. Emotional stability is important because assistants must maintain a positive, bright outlook while helping patients with very difficult handicaps. Patience and the ability to recognize and appreciate slight improvements also are helpful.

As physical therapist assistants gain experience, they may advance to more responsible duties with corresponding pay increases. Physical therapist assistants with an associate degree from an accredited program sometimes advance to physical therapists by earning the bachelor's degree in physical therapy. A student thinking about this option should arrange his or her associate degree curriculum carefully to correspond to the undergraduate requirements of the bachelor's degree program under consideration.

## Job Outlook

Job prospects should be excellent for graduates of accredited training programs. The number of physical therapist assistants is expected to increase much faster than the average for all occupations as the demand for rehabilitation services continues to grow. Many new jobs for physical therapist assistants will be created as programs to aid disabled persons expand, and as long-term care facilities attempt to provide residents with more adequate therapy and rehabilitation services.

The aging of the population will spur demand for rehabilitation personnel in hospitals, nursing homes, and home health agencies. The number of people who need therapy will increase sharply: Very rapid growth is projected for the population age 75 and above, an age group that suffers a relatively high incidence of disabling accidents and illnesses. However, the degree to which population growth is translated into new jobs for physical therapist assistants will depend upon other factors as well, including the extent to which health care providers encourage this level of care for elderly patients, and the availability of funds to pay for it.

In addition to jobs created by increased demand for these workers, openings will result from replacement needs, which are relatively high.

## Earnings

Starting salaries for physical therapist assistants averaged between $11,500 and $13,500 a year in 1980, according to the limited information available. Experienced assistants generally earned between $12,000 and $18,000 a year. Physical therapist assistants working for the Veterans Administration (VA) earned starting salaries of about $9,800 a year in 1980, and the average salary paid physical therapist assistants with the VA was about $14,200 annually.

## Related Occupations

Physical therapist assistants administer routine therapeutic exercises and treatment under the direction of a physical therapist. Other workers who assist health professionals include occupational therapy assistants, orthotic assistants, prosthetic assistants, medical assistants, dental assistants, and optometric assistants.

## Sources of Additional Information

Information on a career as a physical therapist assistant and on programs that offer training is available from:

American Physical Therapy Association, 1156 15th St. NW., Washington, D.C. 20005.

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# Cleaning and Building Service Occupations

Every public building and apartment house needs to be kept clean and in good condition for the comfort and safety of the people who work or live there. This work is done by persons in cleaning and building service occupations, who clean floors and windows in hospitals, change linens in hotels, repair broken faucets in apartments, operate elevators, or exterminate insects and rodents in office buildings.

Workers who have limited skills or little education can often find jobs in this field. Skills usually are learned on the job, but other training sometimes is available. Building custodians, for example, may attend training programs offered by unions and government agencies. Maids and housekeepers may take homestudy or classroom courses in housekeeping procedures offered by their employer, junior colleges, or technical institutes. Workers who learn their jobs thoroughly and show that they can handle responsibility may advance to supervisory positions.

Besides a knowledge of their job, these workers must be courteous, tactful, and neat if their job requires contact with the public. They should be able to follow instructions and work well on their own. Some of these workers perform monotonous and tiring tasks, such as scrubbing and waxing floors or making up beds, and must be able to tolerate the boredom of the job.

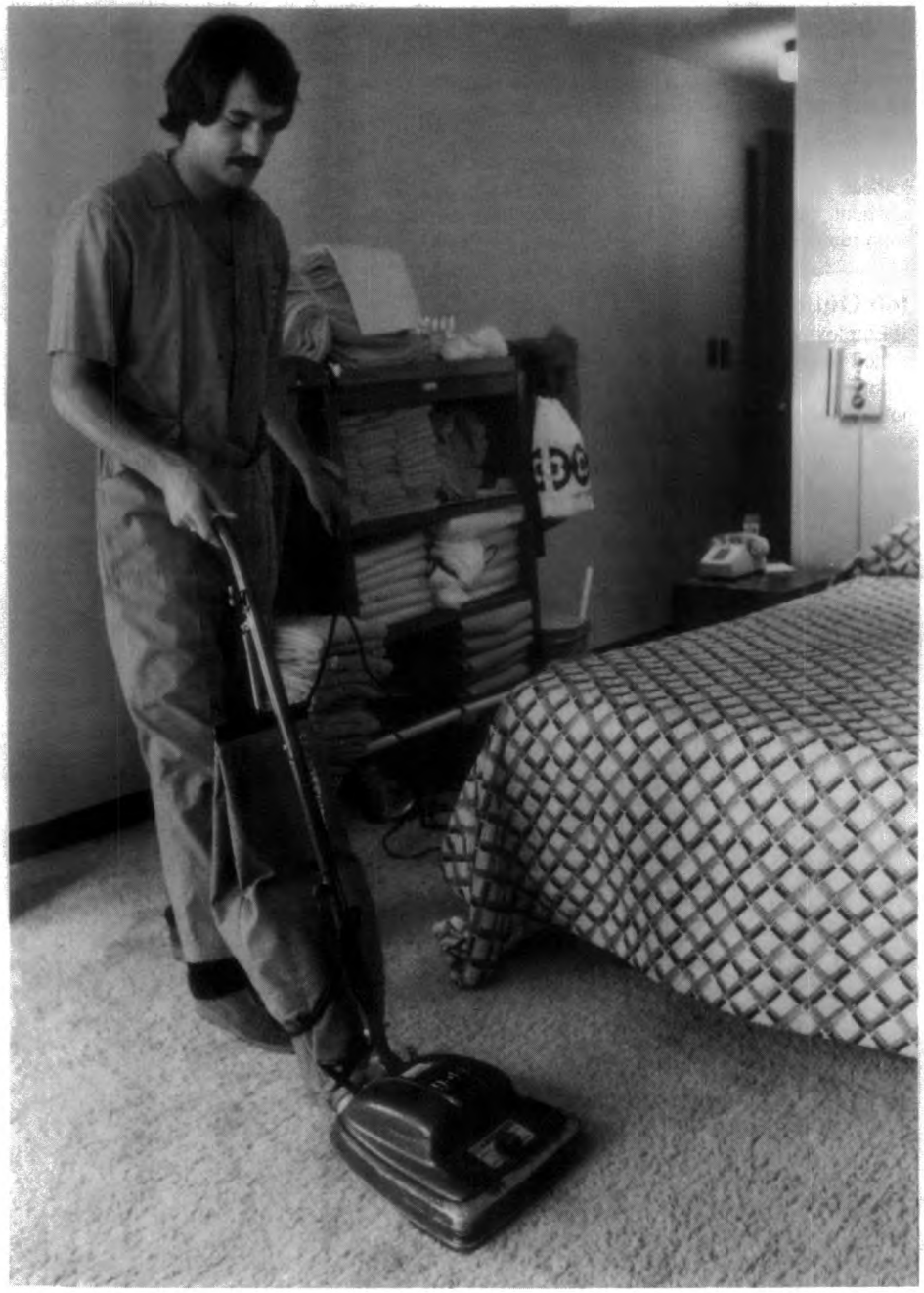
Starting pay for most cleaning and building service workers is relatively low.

Employment of these workers should increase as additional hotels, office buildings, and other structures that require cleaning and maintenance are built. Job turnover is high in these occupations. Thus, besides jobs created by increased demand for cleaning and building services, many job openings will occur each year as workers transfer to other occupations, leave their jobs for personal reasons, retire, or die.

The following tabulation shows 1980 employment levels in various cleaning and building service occupations.

| | |
|---|---|
| Janitor and sexton | 2,751,000 |
| Elevator operator | 49,000 |
| Exterminator | 26,000 |
| Termite treater and helper | 9,000 |

This section of the *Handbook* describes one cleaning and building service occupation, hotel housekeepers and assistants.



Hotel housekeeping is primarily administrative, but housekeepers sometimes have to do the cleaning themselves.

## Hotel Housekeepers and Assistants

(D.O.T. 321 and 323.137-010)

### Nature of the Work

A hotel or motel's reputation depends on how well its staff and facilities serve its guests. Although some offer economical accommodations and others stress luxurious surroundings and attentive service, all hotel organizations are concerned with their guests' comfort. Hotel housekeepers are responsible for keeping hotels and motels clean and attractive and providing guests with essential furnishings and supplies. It is their job to hire, train, schedule, and supervise the housekeeping staff, including linen and laundry workers, and repairers. They also keep employee records and order supplies. About 18,000 persons worked as hotel housekeepers in 1980.

Housekeepers who work in small or middle-sized establishments may not only supervise the housekeeping staff, but perform some of these duties themselves. In contrast, the work of housekeepers in large or luxury hotels is primarily administrative, and they are usually called executive or head housekeepers.



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Besides supervising a staff that may number in the hundreds, executive housekeepers prepare the budget for their departments; submit reports to the general manager on the condition of rooms, needed repairs, and suggested improvements; and purchase supplies and furnishings. Executive housekeepers are assisted by floor housekeepers who supervise the cleaning and maintenance of one or several floors in the hotel, and assistant executive housekeepers who help with the administrative work.

Some larger hotel and motel chains assign executive housekeepers to special jobs, such as reorganizing housekeeping procedures in an established hotel or setting up the housekeeping department in a new motel.

## Working Conditions

Since hotels are open around the clock, night and weekend work are common. Hotel employees frequently must work on shifts. Housekeepers who live in the hotel usually have regular work schedules, but they may be called for work at any time.

Hotel housekeepers sometimes experience the pressures of coordinating a variety of functions. Dealing with irate patrons can also be stressful. Supervising the preparation of rooms for incoming guests around checkout time can be particularly hectic.

## Training, Other Qualifications, and Advancement

Housekeeping positions require little or no specialized educational training, but most employers prefer applicants who have a high school diploma. Likewise, experience or training in hotel housekeeping also is helpful in getting a job.

Several colleges, junior colleges, and technical institutes offer instruction in hotel administration that includes courses in housekeeping; some of these courses are offered in summer or evening classes. Many schools have developed programs under the guidance and approval of the National Executive Housekeepers Association, an organization that confers certified membership status upon those members who complete certain education and experience requirements. In addition, the Educational Institute of the American Hotel and Motel Association offers courses for either classroom or home study. Most helpful are courses on housekeeping; personnel management; budget preparation; recordkeeping; interior decoration; safety practices; environmental controls; and the purchase, use, and care of different types of equipment and fabrics.

While executive housekeepers should be good at planning and organizing, they also should be able to deal effectively with people, especially the housekeeping personnel. Housekeepers also should be able to work independently, keep records, and analyze numbers.

Although assistant housekeepers may be promoted to executive housekeepers after several years of experience, opportunities are limited because only one executive housekeeper job is available in any hotel or motel. Those who have degrees or have taken courses in institutional housekeeping management may have the best advancement opportunities.

## Job Outlook

Employment of hotel housekeepers is expected to grow faster than the average for all occupations through the 1980's as additional hotels and motels are built and chain and franchise operations spread. Many openings will result from the need to replace workers who transfer to other occupations, die, or retire.

Because established hotels usually fill vacancies by promoting assistant housekeepers to executive housekeepers, beginners will find their best job opportunities in newly built motels or hotels. Seasonal job opportunities will be available in resort hotels and motels that are open only part of the year.

## Earnings

Salaries of housekeepers depend on the location, size, and type of hotel in which they work. Large luxury hotels and those located in metropolitan areas generally pay their housekeepers more than hotels whose rooms and services are less expensive and those located in less populated areas.

Executive housekeepers earned salaries ranging from about $7,500 to more than $40,000 in 1980, with an average salary of almost $20,000. Those who work the night shift usually receive additional compensation. In addition to their salaries, hotels sometimes furnish housekeepers and their families with lodging in the hotel, meals, parking facilities, laundry, and other services.

Most hotel employees receive 5 to 10 paid holidays a year, paid vacations, sick leave, life insurance, medical benefits, and pension plans. Some hotels offer bonuses, educational assistance, and other benefits to their employees.

## Related Occupations

Hotel housekeepers and assistants are not the only workers concerned with hiring, training, scheduling, and supervising workers when pleasing customers and providing service are important. Other occupations involving similar responsibilities include apartment building superintendents, janitorial service operators, pursers, and supervisory maintenance engineers.

## Sources of Additional Information

Information on careers in housekeeping and a list of schools offering programs in institutional housekeeping management are available from:

National Executive Housekeepers Association, Inc., Business and Professional Building, 414 Second Ave., Gallipolis, Ohio 45631.

Information on careers and scholarships in the lodging industry may be obtained from:

The American Hotel and Motel Association, 888 7th Ave., New York, N.Y. 10019.

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# Personal Service Occupations

Personal service workers perform a variety of tasks for other people. They cut hair, make airplane passengers comfortable, conduct tours, take theater tickets, check coats, carry baggage, care for children, and do household chores for people who cannot manage for themselves. Because the work involves doing things for others, the ability to deal effectively with all kinds of people is a "must." A pleasant personality, tact, and a sense of humor are decided assets.

Nearly 1.7 million persons were employed in personal service occupations in 1980. *Cosmetologists* and *child care workers* (who supervise children in nursery schools, play groups, and babysitters' own homes) are by far the largest of these occupations, employing about a half a million people each in 1980. Employment estimates for selected personal service occupations are shown in the accompanying table.

**Table 1. Employment in selected personal service occupations, 1980**

| Occupation | Employment |
|---|---|
| Cosmetologists and related workers | 513,000 |
| Cosmetologist | 466,000 |
| Shampooer | 21,000 |
| Manicurist | 16,000 |
| Scalp treatment operator | 10,000 |
| Child care worker and attendant | 496,000 |
| Barber | 112,000 |
| Recreational facility attendant | 69,000 |
| Flight attendant | 56,000 |
| Elevator operator | 49,000 |
| Usher, lobby attendant, and ticket taker | 41,000 |
| Games and rides operator | 29,000 |
| Funeral attendant | 10,000 |
| Checkroom and locker room attendant | 10,000 |

SOURCE: Bureau of Labor Statistics.

Some personal service jobs require formal training that lasts from several weeks to a year or so. Flight attendants go to training schools run by the airlines themselves; barbers and cosmetologists generally learn their trade in public or private vocational schools. Most other personal service workers, however, acquire their skills on the job. A high school diploma is necessary for some of these jobs. All employers stress the importance of such personal characteristics as poise, good grooming, and a pleasant disposition. Physical stamina is important, for much of the work involves being on one's feet for long periods of time.

Starting pay in many of these jobs is at or only slightly above the minimum wage. Often, however, workers also receive tips that add substantially to their income. Some workers—cosmetologists in particular—are employed on a commission basis. Many of these workers eventually open their own businesses.

Indeed, the large proportion of people who work for themselves is a distinguishing characteristic of the personal service occupations. In 1980, fully 35 percent of these workers were self-employed, compared to only 8 percent of all workers. Running one's own business is especially prevalent among barbers (73 percent self-employed), cosmetologists (50 percent), and child care workers (41 percent). People who aspire to work for themselves must not only be good enough at what they do to maintain a steady flow of customers, they also must have the drive and business acumen to handle finances, suppliers, and staff.

Employment in these occupations is expected to increase about as fast as the average for all occupations through the 1980's, in response to the demand that will be generated by higher incomes, more multiearner families, and more elderly people. Demand for child care workers and welfare service aides is expected to be especially strong. Jobholding by mothers of preschool or school-aged children is expected to remain at very high levels through the 1980's. (The proportion of children under 6 whose mothers were at work rose sharply in the 1970's.) Jobholding by women stimulates a demand, not only for child care services, but for a host of other "substitute homemaker" services including cleaning, shopping, and food preparation. Employment of welfare service aides, a category that includes geriatric aides and homemaker-home health aides, will rise in response to increased demand for community and in-home services for the elderly.

While heightened demand for personal service workers will create numerous job openings during the 1980's, even more openings will result from the need to replace workers who leave their jobs. Replacement needs are substantial in these occupations, for turnover tends to be high. For information on prospects in particular occupations, see the *Handbook* statements that follow.

## Barbers

(D.O.T. 330.371-010 and -014)

### Nature of the Work

Barbers cut, trim, shampoo, and style hair. While many persons go to a barber for just a haircut, services such as hairstyling and permanents have become increasingly popular. Barbers trained in these areas are called "hairstylists" and work in styling salons, "unisex" salons, and some barbershops. They cut and style hair to suit each customer and may color or straighten hair and fit hairpieces. Most barbers offer hair and scalp treatments, shaves, and facial massages.

By tradition, most customers are men. However, a small but growing number of barbers cut and style women's hair. They usually work in unisex salons—shops that have male and female customers. Some States require a cosmetologist's license as well as a barber's license, however, to permanent wave or color women's hair.

As part of their responsibilities, barbers keep their scissors, combs, and other instruments sterilized and in good condition. They clean their work areas and may sweep the shop as well. Some sell lotions, tonics, and other cosmetic supplies. Those who own or manage a shop have additional responsibilities such as ordering supplies, paying bills, keeping records, and hiring employees.

### Working Conditions

Barbers usually work in clean, pleasant surroundings, with good lighting and ventilation. Good health and stamina are important because barbers must stand on their feet a great deal and work with both hands at shoulder level—a position that can be tiring.

Most full-time barbers work more than 40 hours a week, and a workweek of over 50 hours is not uncommon. Although Saturdays and lunch hours are generally very busy, a barber may have some time off during slack periods. To assure an even workload, some barbers ask customers to make appointments.

### Employment

Most of the 112,000 barbers in 1980 worked in barbershops. Some worked in unisex salons, and a few worked in department stores, hotels, hospitals, and prisons. Three out of four barbers operated their own businesses. Few barbers work part time.

Almost all cities and towns have barbershops, but employment is concentrated in the most populous cities and States. Hairstylists usually work in large cities where the greatest demand for their services exists.

### Training, Other Qualifications, and Advancement

All States require barbers to be licensed. The qualifications necessary to get a license vary from one State to another, however. Generally a person must be a graduate of a State-approved barber school and be at least

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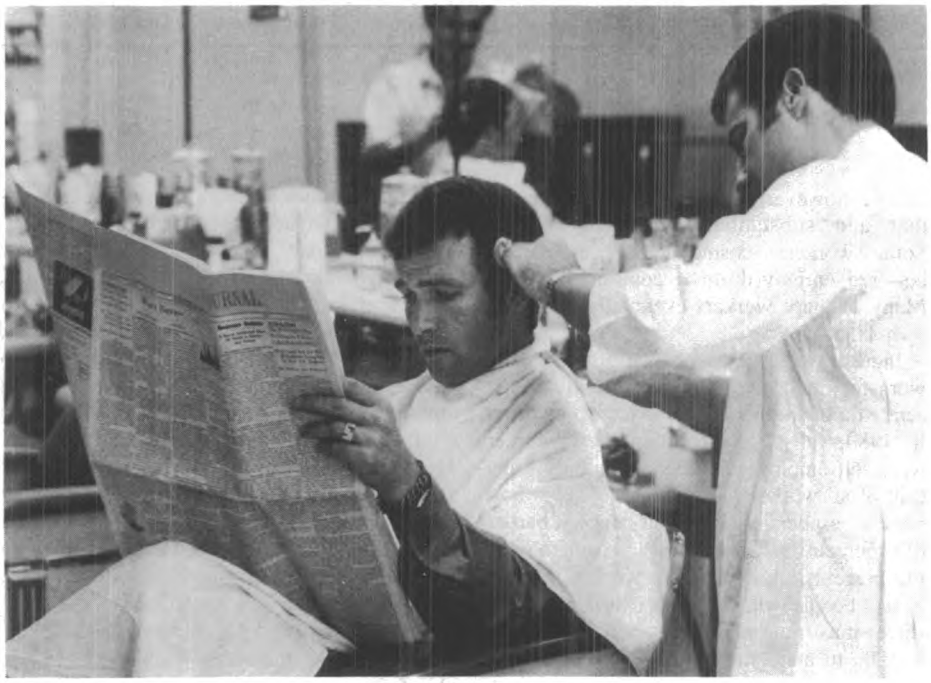

Barber school training usually takes 9 to 12 months.

16 (in some States 18) years old. In addition, States have varying education requirements—some require graduation from high school, while others have no requirement at all.

Many States require a beginner to take an examination for an apprentice license, and serve 1 or 2 years as an apprentice before taking the examination required for a license as a registered barber. In the examinations, the applicant usually is required to pass a written test and demonstrate an ability to perform the basic services. Fees for these examinations range from $15 to $85.

Because some States do not recognize training, apprenticeship work, or licenses obtained in another State, persons who wish to become barbers should review the laws of the State in which they want to work before entering a barber school.

Barber training is offered in about 360 schools; 3 out of 4 barber schools are private. Some public high schools offer barbering in their vocational programs. Barber school programs usually last 9 to 12 months. Students buy their own tools, which cost about $450. They study the basic services—haircutting, shaving, facial massaging, and hair and scalp treatments—and, under supervision, practice on customers in school "clinics." Most schools now teach unisex hairstyling and chemical styling as part of their regular curriculum. Besides attending lectures on barber services and the use and care of instruments, students take courses in sanitation and hygiene, and learn how to recognize certain skin conditions. Instruction also is given in selling and general business practices. Advanced courses are available in some localities for barbers who wish to update their skills or specialize in hairstyling, coloring, and the sale and service of hairpieces.

Dealing with customers requires patience and a better than average disposition. In addition, good eye-hand coordination is required. Barbers also should have sound judgment about what hair style is most flattering.

Beginners usually get their first jobs through the barber school they attended.

Some experienced barbers advance by becoming managers of large shops or by opening their own shops. A few may teach at barber schools. Barbers who go into business for themselves must have the capital to buy or rent a shop and install equipment. New equipment for a one-chair shop averaged about $4,000 in 1980. Some shopowners buy used equipment and fixtures at reduced prices, however.

## Job Outlook

The employment decline of the last decade is not expected to continue as population growth and the increasing popularity of hairstyling offset the effect of the fashion for longer hair. The occupation is expected to grow through the 1980's, but more slowly than the average for all occupations. Most job openings, therefore, will occur because of the need to replace barbers who transfer to other kinds of work, retire, or die. Replacement needs in barbering are high, compared with many other occupations.

The shift in consumer preferences from regular haircuts to more personalized and intensive services has greatly affected the occupation. Barbers who specialize in hairstyling have been much more successful than those who offer conventional services. This trend is expected to continue, and employment opportunities should be better for hairstylists than for other barbers.

## Earnings

Barbers receive income from commissions or wages and tips. Most barbers who are not shopowners normally receive 60 to 70 percent of the money they take in; a few are paid straight salaries.

Most barbers and hairstylists in their first few years of employment earned between $12,000 and $17,000 a year in 1980, according to limited information available. Many experienced barbers and hairstylists earned over $20,000 a year. Hairstylists usually earn more than barbers because the services they provide are more personalized and therefore more expensive.

Earnings depend on the size and location of the shop, customers' tipping habits, competition from other barbershops, and the barber's ability to attract and hold regular customers. Some barbers receive 1- or 2-week paid vacations, insurance, and medical benefits.

The principal union that organizes barbers—both employees and shopowners—is the United Food and Commercial Workers International Union. The principal association that represents and organizes shopowners, managers, and employees is the Associated Master Barbers and Beauticians of America.

## Related Occupations

Other workers whose main activity consists of improving a patron's personal appearance include cosmetologists, electrologists, makeup artists, manicurists, scalp treatment operators, and shampooers.

## Sources of Additional Information

Lists of barber schools, by State, are available from:

National Association of Barber Schools, Inc., 304 South 11th St., Lincoln, Nebr. 68508.

National Association of Trade and Technical Schools, 2021 K St. NW., Washington, D.C. 20006.

Every State maintains information on State licensing requirements and approved barber schools. For details, contact the State board of barber examiners or the equivalent authority at your State capital.

Additional information on this occupation is available from:

National Barber Career Center, 3839 White Plains Rd., Bronx, N.Y. 10467.

Associated Master Barbers and Beauticians of America, 219 Greenwich Rd., P.O. Box 220782, Charlotte, N.C. 28222.

# Bellhops and Bell Captains

(D.O.T. 324 except .677-014)

## Nature of the Work

Bellhops carry baggage for hotel and motel guests and escort them to their rooms on arrival. When showing new guests to their rooms, bellhops make sure everything in the room is in order and may offer information about valet services, restaurant hours,

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or other hotel services. Bellhops also run errands for guests and may relieve elevator operators or switchboard operators in smaller properties.

Large and medium-sized hotels employ bell captains to supervise the service staff. They plan work assignments, record the hours each bellhop is on duty, and train new employees. Bell captains take care of any unusual requests guests may make and handle any complaints regarding the department. If a bellhop is unavailable, they sometimes help arriving or departing guests. In 1980, about 21,000 persons worked as bellhops or bell captains.

A few hotels have large service departments and employ superintendents of service to supervise bell captains and bellhops, elevator operators, doorkeepers, and washroom attendants.

## Working Conditions

Since hotels are open around the clock, night and weekend work is common. While bellhops work on shifts, fewer employees work the night shift than the day shifts.

The job can sometimes be quite strenuous, as bellhops often must stand for long periods and carry heavy baggage. Also, bellhops must work quickly and under pressure when several patrons require service at once. The job can be particularly hectic around checkout time.

## Training, Other Qualifications, and Advancement

A high school education is not essential for work as a bellhop, but it does increase the chances for promotion to a job as desk clerk or reservation clerk. Frequently, hotels promote elevator operators to bellhop positions.

Because bellhops have frequent contact with guests, they must be neat, tactful, and courteous. A knowledge of the local area is an asset because guests often ask about local tourist attractions, restaurants, and transportation services.

Bellhops can advance to bell captain and then to superintendent of service, but opportunities are limited.

## Job Outlook

Employment of bellhops is expected to grow more slowly than the average for all occupations through the 1980's. Most openings will result from the need to replace workers who transfer to other occupations, die, or retire.

Although many motels now offer services similar to those of a hotel and employ bellhops, the growing popularity of economy motels that offer only basic services is expected to limit employment growth. New workers will have better opportunities in motels and small hotels because the large luxury hotels prefer to hire experienced workers. Seasonal job opportunities will be available in resort areas where hotels and motels are open only part of the year.

Bellhops carry luggage to and from guests' rooms.

## Earnings

Earnings of bellhops depend on the location, size, and type of hotel in which they work. Large luxury hotels and those located in metropolitan and resort areas generally pay their employees more than less expensive hotels and those located in less populated areas. In 1980, bellhops earned from $3.24 to $5.99 per hour, according to a survey of metropolitan areas. Bellhops often receive tips that may add substantially to their income. Those who work the night shift usually receive additional compensation.

Most hotel employees receive 5 to 10 paid holidays a year, paid vacations, sick leave, life insurance, medical benefits, and pension plans. Some hotels offer bonuses, educational assistance, and other benefits to their employees.

Many bellhops belong to the Hotel Employees and Restaurant Employees International Union.

## Related Occupations

Bellhops and bell captains do most of their work in a fast-paced, hectic setting; usually in large hotels or resorts. Other workers who perform similar jobs are baggage porters, skycaps, and doorkeepers.

## Sources of Additional Information

For information on job opportunities for bellhops, contact the personnel offices of hotels in your area and the nearest office of the State employment service.

# Cosmetologists

(D.O.T. 331.674-010; 332.271-010, -014, and -018; 339.371-014)

## Nature of the Work

Hair has been a center of attention since people first began to care about their appearance. Throughout history a great deal of effort has gone into acquiring a fashionable hairstyle or a perfectly trimmed beard. Although styles change from year to year, the cosmetologist's task remains the same—to help people look attractive.

Cosmetologists, who also are called *beauty operators*, *hairstylists*, or *beauticians*, shampoo, cut, and style hair, and advise patrons on how to care for their hair. Frequently they straighten or permanent wave a patron's hair to keep the style in shape. Cosmetologists may also lighten or darken the color of the hair. Cosmetologists may give manicures, scalp and facial treatments; provide makeup analysis for women; and clean and style wigs and hairpieces.

Most cosmetologists make appointments and keep records of hair color formulas and

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Hair stylists need a sense of artistry.

permanent waves used by their regular patrons. They also keep their work area clean and sanitize their hairdressing implements. Those who operate their own salons also have managerial duties which include hiring and supervising workers, keeping records, and ordering supplies.

## Working Conditions

Cosmetologists generally work in clean, pleasant surroundings, with good lighting and comfortable temperatures. Their work can be arduous and physically demanding because they must be on their feet for hours at a time and work with their hands at shoulder level. Many full-time cosmetologists work more than 40 hours a week, including evenings and Saturdays when beauty salons are busiest.

## Employment

Most of the 513,000 cosmetologists employed in 1980 worked in beauty salons. Some worked in "unisex" salons, barber shops, or department stores, and a few were employed by hospitals and hotels. Many worked part time. Many cosmetologists operated their own businesses.

All cities and towns have beauty salons, but employment is concentrated in the most populous cities and States. Those cosmetologists who set fashion trends with their hairstyles usually work in New York City, Los Angeles, and other centers of fashion and the performing arts.

## Training, Other Qualifications, and Advancement

Although all States require cosmetologists to be licensed, the qualifications necessary to obtain a license vary. Generally, a person must have graduated from a State-licensed cosmetology school, pass a physical examination, and be at least 16 years old. In addition, States have varying education requirements—some have no requirement, while others require graduation from high school. In some States completion of an apprentice training program can substitute for graduation from a cosmetology school, but very few cosmetologists learn their skills in this way.

Cosmetology instruction is offered in both public and private vocational schools, in either daytime or evening classes. A daytime course usually takes 6 months to 1 year to complete; an evening course takes longer. Many public school programs include the academic subjects needed for a high school diploma and last 2 to 3 years. An apprenticeship program usually lasts 1 or 2 years.

Both public and private programs include classroom study, demonstrations, and practical work. Most schools provide students with the necessary hairdressing implements, such as manicure implements, combs, scissors, razors, and hair rollers, and include their cost in the tuition fee. Sometimes students must purchase their own. A good set of implements costs between $50 and $100. Beginning students work on mannequins or on each other. Once they have gained some experience, students practice on patrons in school "clinics."

After graduating from a cosmetology program, students take the State licensing examination. The examination consists of a written test and a practical test in which applicants demonstrate their ability to provide the required services. In some States, an oral examination is included and the applicant is asked to explain the procedures he or she is following while taking the practical test. In some States, a separate examination is given for persons who want only a manicurist's license. Some States have reciprocity agreements that allow a cosmetologist licensed in one State to work in another without reexamination.

Persons who want to become cosmetologists must have finger dexterity and a sense of form and artistry. They should enjoy dealing with the public and be willing and able to follow patrons' instructions. Because hairstyles are constantly changing, cosmetologists must keep abreast of the latest fashions and beauty techniques. Business skills are important for those who plan to operate their own salons.

Many schools help their students find jobs. During their first months on the job, new cosmetologists are given relatively simple tasks, such as giving manicures or shampoos, or are assigned to perform the simpler hairstyling patterns. Once they have demonstrated their skills, they are gradually permitted to perform the more complicated tasks such as hair coloring and permanent waving.

Advancement usually is in the form of higher earnings as cosmetologists gain experience and build a steady clientele, but many manage large salons or open their own after several years of experience. Some teach in cosmetology schools or use their knowledge and skill to demonstrate cosmetics in department stores. Others become sales representatives for cosmetics firms, or open businesses as beauty or fashion consultants. Some cosmetologists work as examiners for State cosmetology boards.

## Job Outlook

Employment of cosmetologists is expected to grow about as fast as the average for all occupations through the 1980's in response to population growth and the rising number of working women. Hairstyling for men also contributes to a demand for cosmetologists because many men go to unisex shops or beauty salons for styling services. In addition to the jobs created by increased demand for cosmetologists, many openings will occur because of replacement needs. Turnover is high in this occupation. Opportunities for part-time work will continue to be very good.

Most people regard spending on grooming care as discretionary. During hard economic times, they tend to visit cosmetologists less frequently, which reduces cosmetologists' earnings. Rarely, however, are cosmetologists laid off solely because of economic downturns.

## Earnings

Cosmetologists receive income from commissions or wages, and from tips. Those who are not salon owners receive a percentage of the money they take in, usually 50 percent; a few are paid straight salaries.

Weekly earnings (including tips) of beginning cosmetologists generally ranged between $110 and $145 in 1980, according to limited information available. Experienced

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cosmetologists usually earned between $250 and $350 a week.

Earnings also depend on the size and location of the salon, patrons' tipping habits, competition from other beauty salons, and the individual cosmetologist's ability to attract and hold regular patrons.

Large salons and department stores offer group life and health insurance and other benefit plans. Nearly all employers provide annual paid vacations of at least 1 week after a year's service.

The principal trade association which represents and organizes salon owners, managers, and employees is the National Hairdressers and Cosmetologists Association, Inc. The principal union which organizes cosmetologists—both employees and salon owners—is the United Food and Commercial Workers International Union. Other organizations include the Associated Master Barbers and Beauticians of America; the National Association of Cosmetology Schools, Inc., which represents school owners and teachers; and the National Beauty Culturists' League, representing black cosmetologists, teachers, managers, and salon owners.

## Related Occupations

Other workers whose main activity consists of helping patrons improve their personal appearance include barbers, electrologists, makeup artists, and health club managers.

## Sources of Additional Information

A list of licensed training schools and licensing requirements can be obtained from State boards of cosmetology or from:

National Accrediting Commission of Cosmetology Arts and Sciences, 1990 M St. NW., Suite 650, Washington, D.C. 20036.

Additional information about careers in cosmetology and State licensing requirements is available from:

National Beauty Career Center, 3839 White Plains Rd., Bronx, N.Y. 10467.

National Hairdressers and Cosmetologists Association, 3510 Olive St., St. Louis, Mo. 63103.

For general information about the occupation, contact:

Associated Master Barbers and Beauticians of America, 219 Greenwich Rd., P.O. Box 220782, Charolotte, N.C. 28222.

National Association of Cosmetology Schools, 1990 M St. NW., Suite 650, Washington, D.C. 20036.

# Flight Attendants

(D.O.T. 352.367-010)

## Nature of the Work

Flight attendants (also called stewardesses and stewards) are aboard almost all passenger planes to help make the passengers' flight safe, comfortable, and enjoyable.

Before each flight, attendants are briefed by the captain on expected weather conditions, special passenger problems, and other matters. They see that the passenger cabin is in order. They check that supplies, such as food, beverages, blankets, and reading material, are adequate, and that first aid kits and other emergency equipment are aboard. As passengers come aboard, attendants greet them, check their tickets, and assist them in storing coats and small pieces of luggage in the proper places.

Before the plane takes off, attendants use the public address system to instruct passengers in the use of emergency equipment and check to see that all passengers have their seat belts fastened. In the air, they answer questions about the flight, distribute magazines and pillows, and help care for small children, elderly persons, and handicapped persons. They give first aid to ill passengers. Attendants also serve cocktails and other refreshments. On many flights, they heat and distribute precooked meals. After the plane has landed, the flight attendant assists passengers as they leave the plane. They then prepare reports on medications given to passengers, lost and found articles, and cabin equipment conditions. Some flight attendants straighten up the plane's cabin.

One of the most important functions of attendants is to assist passengers in the rare event of an emergency. This may range from a disabled engine, where passengers must be reassured, to an emergency landing, where attendants open doors and inflate emergency slides to evacuate the plane.

## Working Conditions

Since airlines operate around the clock 365

Flight attendants have to serve people graciously but quickly.

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days a year, attendants may work at night, on holidays, and on weekends. They usually fly 75 to 85 hours a month, but they may work up to 50 hours a month on the ground to prepare planes for flight. As a result of variations in scheduling and limitations on flying time, many attendants have 15 days or more off each month. Attendants may be away from their home bases at least one-third of the time. During this period, the airlines provide hotel accommodations and an allowance for meal expenses.

Flight attendants have the opportunity to meet interesting people and see new places. The combination of free time and discount air fares provides substantial opportunity for travel. However, the work can be strenuous and trying. Many short flights require speedy service if all passengers are to be served. A rough flight can make drinks and meals difficult to serve. Attendants stand during much of the flight and must remain pleasant and efficient regardless of how tired they are or how demanding passengers may be.

## Employment

About 56,000 flight attendants were employed in 1980. The airlines employed the vast majority of all flight attendants, most of whom were stationed in major cities at the airlines' main bases. A small number of flight attendants worked for large companies that use their own aircraft for business and other purposes.

## Training, Other Qualifications, and Advancement

The airlines place great emphasis on hiring poised, tactful, and resourceful people. In particular, applicants should be able to talk comfortably with strangers. Applicants usually must be at least 19 years old, but some airlines have higher minimum age requirements. Flight attendants must have excellent health, good vision, and the ability to speak clearly.

Applicants must be high school graduates. Those having several years of college or experience in dealing with the public are preferred. Flight attendants for international airlines generally must speak an appropriate foreign language fluently.

Most large airlines require that newly hired flight attendants complete 4 to 6 weeks of intensive training in their own schools. The few airlines that do not operate schools generally send new employees to the school of another airline. Transportation to the training centers and an allowance for board, room, and school supplies may be provided. Trainees learn how to react to emergencies, including instruction on evacuating an airplane, operating an oxygen system, and giving first aid. Attendants also are taught flight regulations and duties, and company operations and policies. Trainees receive instruction on personal grooming and weight control. Additional courses in passport and customs regulations are given to trainees for the international routes. Towards the end of their training, students go on practice flights.

After completing training, flight attendants are assigned to one of their airline's main bases. New attendants are placed in "reserve status" and either fill in on extra flights or replace attendants who are sick or on vacation. Reserve attendants on duty must be available on short notice. Attendants usually remain on reserve for at least 1 year; at some cities it may take as long as 5 years to advance from reserve status. Advancement takes longer today than in the past because experienced attendants are remaining in this career for more years than they used to. Attendants who no longer are on reserve bid for regular assignments. Because these assignments are based on seniority, usually only the most experienced attendants get their choice of base and flights.

Opportunities for advancement to other jobs are limited. However, some attendants may advance to flight service instructor, customer service director, instructor, recruiting representative, or various other administrative positions.

## Job Outlook

Employment of flight attendants is expected to grow about as fast as the average for all occupations through the 1980's. In addition to growth in demand for these workers, openings will occur because of the need to replace experienced attendants who retire, die, or transfer to other occupations.

Growth in population and income is expected to increase the number of airline passengers. Airlines usually enlarge their capacity by increasing the number and size of planes in operation. Since Federal Aviation Administration safety rules require 1 attendant for every 50 seats, more flight attendants will be needed.

Employment of flight attendants is sensitive to cyclical swings in the economy. Many flight attendants are laid off during recessions when the demand for air travel declines. Until demand increases, few new attendants are hired.

Because the job is attractive and offers a chance to travel, many people are interested in becoming flight attendants. Also, as more career-minded people enter this occupation, job turnover is declining. As a result, applicants can expect keen competition for the available jobs because the number of applicants is expected to greatly exceed the number of openings. Applicants with at least 2 years of college and experience in dealing with the public have the best chance of being hired.

## Earnings

Annual earnings of all flight attendants who worked for the airlines averaged about $19,000 in 1980. According to a number of union contracts, salaries of most beginning flight attendants on domestic flights ranged from about $775 to $900 a month, while those on international flights earned from about $950 to $1,050. In addition, flight attendants and their immediate families are entitled to reduced fares on their own and most airlines.

Most flight attendants are members of either the Transport Workers Union of America or the Association of Flight Attendants.

## Related Occupations

Other jobs that involve helping people and require the ability to be pleasant even under trying circumstances include tour guide, gate agent, host or hostess, waiter or waitress, and camp counselor.

## Sources of Additional Information

For further information, request *Flight Attendants*, publication GA-300-127, (enclose a self-addressed mailing label) from: U.S. Government Printing Office, Library and Statutory Distribution Service, 5208 Eisenhower Ave., Alexandria, Va. 22304.

Information about job opportunities in a particular airline and the qualifications required may be obtained by writing to the personnel manager of the company. Addresses of companies are available from:

Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

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# Agricultural and Forestry Occupations

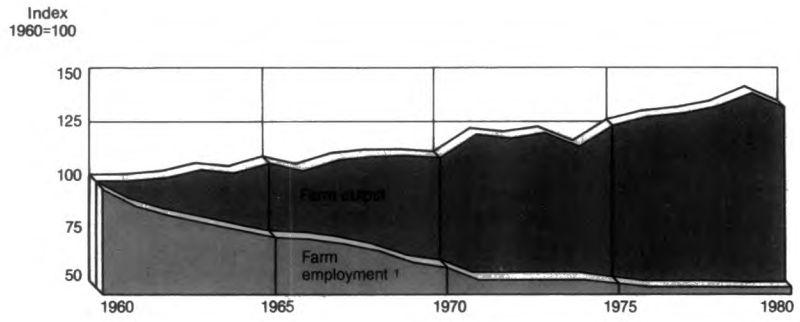
The workers described in this section of the *Handbook* are involved in the development, production, and distribution of basic products that meet our country's needs for food, clothing, and shelter. Agricultural workers raise crops and livestock that provide food as well as material for clothing. Forestry workers harvest trees that provide lumber for housing and other buildings as well as material for a variety of paper products. Producing these goods requires many different kinds of workers, ranging from scientists who develop high-yield seeds and fertilizers to the farmers, ranchers, and timbercutters who harvest the crops. The accompanying tabulation shows 1980 employment for selected agricultural and forestry occupations.

| | |
|---|---|
| Farmer | 1,447,000 |
| Farm laborer | 1,175,000 |
| Gardener, groundskeeper | 650,000 |
| Animal caretaker | 94,000 |
| Timbercutting and logging worker | 75,000 |
| Farm manager | 37,000 |
| Farm supervisor | 30,000 |

Training requirements vary widely. Farm laborers in general can learn their jobs in a few hours. Because of the complexity of modern agriculture and forestry, however, many jobs in these fields require some technical training. Forestry technicians, for example, need 1 or 2 years of specialized, postsecondary training. College training is required for many agriculture and forestry engineering, research, and administrative jobs, and is becoming increasingly important for farm operators.

The occupational statements in this chapter describe in detail the work, training, and job outlook for forestry technicians and for farm and non-farm agricultural workers.

**Although farm output has been increasing, employment of farm workers has continued to decline**




[1]Includes self-employed and unpaid family workers
Sources: Bureau of Labor Statistics and U.S. Department of Agriculture

## Agricultural Occupations

(D.O.T. 180, 40 exc. 406, 41 exc. 419, and 42)

For decades, the word agriculture has referred to agricultural production or farming. Today, this word encompasses more than just farm production; it also extends to many activities off the farm—food and fiber processing, marketing, and distribution; farm implement production and sales; and feed and fertilizer manufacturing. This section discusses occupations in basic farm production and also off-farm occupations utilizing agricultural knowledge and skills.

### Farm Occupations

American farm workers are the most productive agricultural workers in the world. They produce enough food and fiber to meet the needs of our Nation and to export vast quantities to countries around the world.

*Farm operators*. Farm operators may be farmers (owners or renters) or farm managers. The specific tasks of a farm operator are determined by the type of farm, but, in general, the operator is responsible for planning, tilling, planting, fertilizing, cultivating, and harvesting crops. After harvesting, operators make sure that crops are packaged, loaded, and delivered promptly to market. Those who raise livestock must feed and care for their animals and keep barns, pens, and other farm buildings clean. Farm operators perform tasks, ranging from setting up and operating machinery to erecting fences and sheds. The size of the farm often determines which of these tasks operators will handle themselves. Operators of large farms have employees do much of the physical work that small-farm operators do themselves. Although employment on most farms is limited to the farm operator and one or two family workers or hired employees, large farms often have 100 full-time workers or more. Some of these are in nonfarm occupations, such as truckdrivers, sales representatives, and clerks.

In addition to the physical work, farm operators also must make the management decisions required for modern farming. They must determine the best time to seed, fertilize, cultivate, and harvest. They must carefully plan the combination of crops they grow so that, if the price of one crop goes down, they will have sufficient income from another to make up for it. Also, prices of crops and livestock change from one month to another, and farm operators who plan ahead may be able to store their crops or keep their livestock to take advantage of better prices later in the year. Farm operators must secure loans from credit agencies to finance the purchase of machinery, fertilizer, livestock, and feed. They also keep financial records of the farm operation and train and supervise workers in the use of equipment and performance of farm chores.

*Farm laborers*. Farm laborers, both hired farm workers and members of farm families, perform many of the tasks of modern farming. On a farm with diversified agriculture, for example, laborers care for livestock and crops as well as maintain structures and equipment.

Livestock generally require a great deal of attention on a day-to-day basis. Farm workers must mix feed and additives and fill feed and water troughs. They clean barns and animal pens; check livestock regularly for signs of disease or infection; and often vaccinate livestock, such as cattle and poultry, against diseases or spray them with insecticides to protect against harmful parasites. Also, laborers on dairy farms must clean and milk cows twice a day.

In contrast, laborers on crop farms have duties that vary with the seasons. Before seeding, they must prepare the soil by plowing, harrowing, and fertilizing. Once the crops are partially grown, workers cultivate

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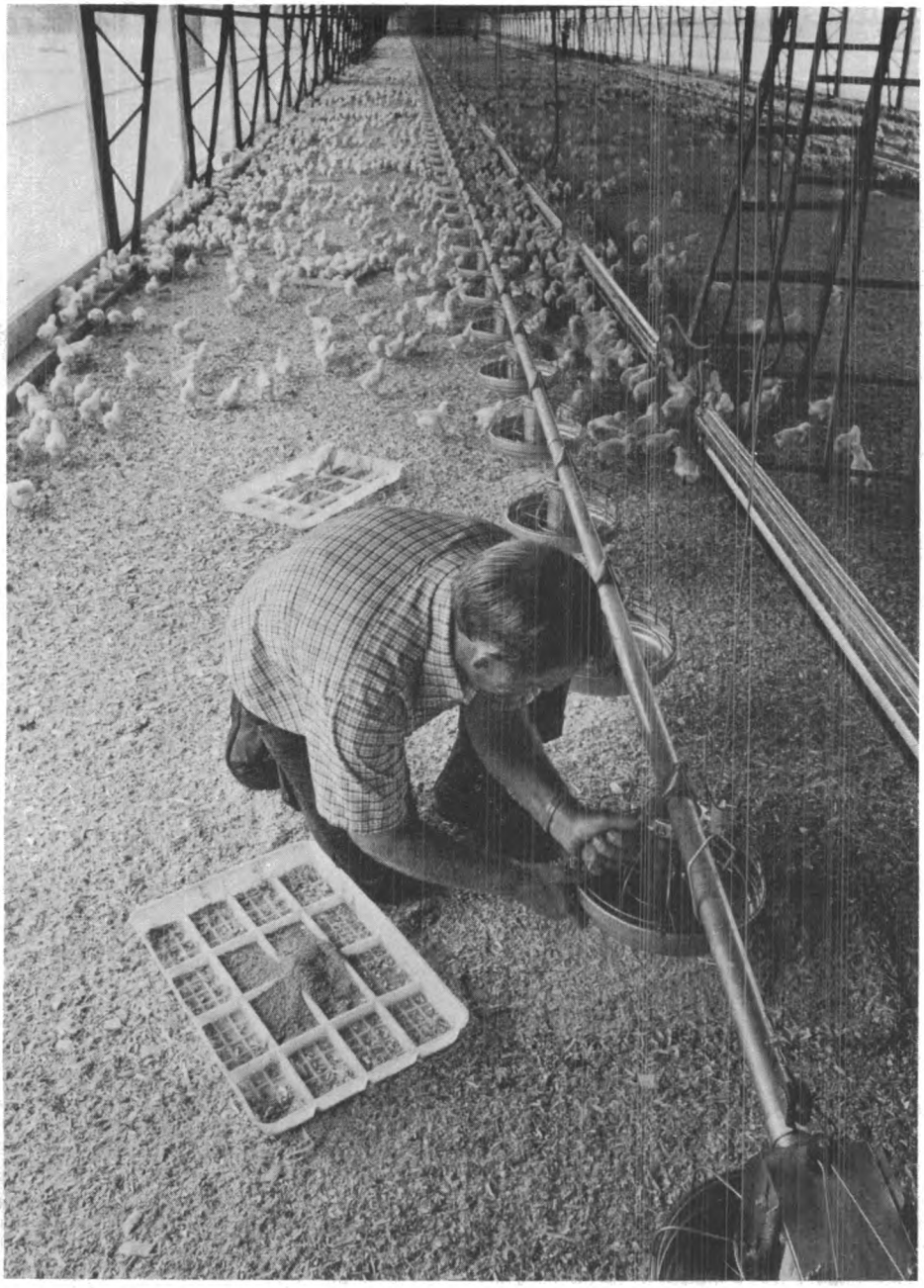

Modern poultry farms use automatic feeding and watering systems.

fields to loosen soil and reduce the number of weeds. Often, crops are sprayed to control weeds, harmful insects, and fungi. Farm workers also assist in harvesting, storing, packing, and transporting crops.

Many of the tasks performed by farm workers require machinery, such as milking machines, hay balers, and cotton-pickers. In addition to setting up and operating machinery, farm workers maintain and clean it and may do necessary minor repairs. Also, they maintain and repair farm structures, including barns, fences, and irrigation systems.

Farm workers generally perform some, or all, of these duties regardless of farm location or what crops are grown. However, many types of crops require special attention. For example, a laborer working in an orchard may have to transplant seedlings, prune fruit trees, thin immature fruit to improve quality, and prop up overloaded branches.

Other farm laborers may perform specialized duties depending on the location of the farm. In areas where rain is insufficient, farm workers water crops by controlling the flow of water from irrigation ditches. They also operate portable sprinkling systems that pump water through pipes spread on the ground and move the pipes from one area to another.

Farms producing fruits or vegetables often need a large number of workers to harvest their crops. On these farms, laborers have more specialized duties. For instance, some laborers pick the produce, others sort it, and others package it for market. Other laborers may spend most of their time operating a particular piece of machinery. Still others may be full-time maintenance workers.

*Farm supervisors*. When many workers are employed in specialized jobs, farm supervisors are needed to coordinate work activities. They schedule the work of crews and may hire additional workers, especially during the harvesting season. Farm supervisors also teach new employees how to use machinery and tools and keep records of production and crop conditions. (For additional information on these workers see the chapter on blue-collar worker supervisors elsewhere in the *Handbook*.)

## Off-Farm Occupations

In addition to those who grow crops and raise livestock, modern agriculture also involves millions of workers who are not directly involved in farming. The number and variety of off-farm jobs have increased as the business and technical aspects of farming have become more complex. Off-farm agricultural jobs involve many activities: Research, education, management and administration, production services, sales, and food and fiber processing.

**Research**. Many scientists and technicians conduct research vital to increasing farm production. Agronomists, for example, conduct experiments in crop problems and develop new methods of growing crops. Animal scientists conduct research into breeding, feeding, and marketing farm animals and develop improved methods of housing, sanitation, and parasite and disease control. Agricultural engineers apply engineering principles to farming. They design machinery that enables farmers to increase their production. Some work for electric utility companies, developing efficient methods of utilizing electric power on farms and in food processing. Still others are employed by the Federal Government in soil and water management.

Persons with technical skills related to agriculture also assist agricultural and biological research scientists. Biological technicians work primarily in laboratories in which biological scientists are engaged in crop research and development. Agricultural technicians generally work in experimental areas, such as fields, greenhouses, or barns where they assist agricultural scientists in experiments conducted under actual growing conditions.

Research technicians may perform a variety of duties. For example, they generally are responsible for preparing animals, insects, plants, soils, and food samples for tests. Other responsibilities include setting up and adjusting instruments and equipment, conducting experiments, and tabulating and recording data. Additional duties, such as caring for laboratory animals, may be part of the job.

**Education**. Agricultural education is an important and growing area of employment in the field of agriculture. Because of constant technological innovations in production processes, teachers are a vital link between agricultural researchers and future farmers.

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Vocational education teachers instruct secondary school and adult education classes in farm management; agricultural production; agricultural supplies and services; operation, maintenance, and repair of farm equipment; processing of farm products; and ornamental horticulture. Several 2- and 4-year colleges and universities in every State now offer degree programs in the agricultural sciences.

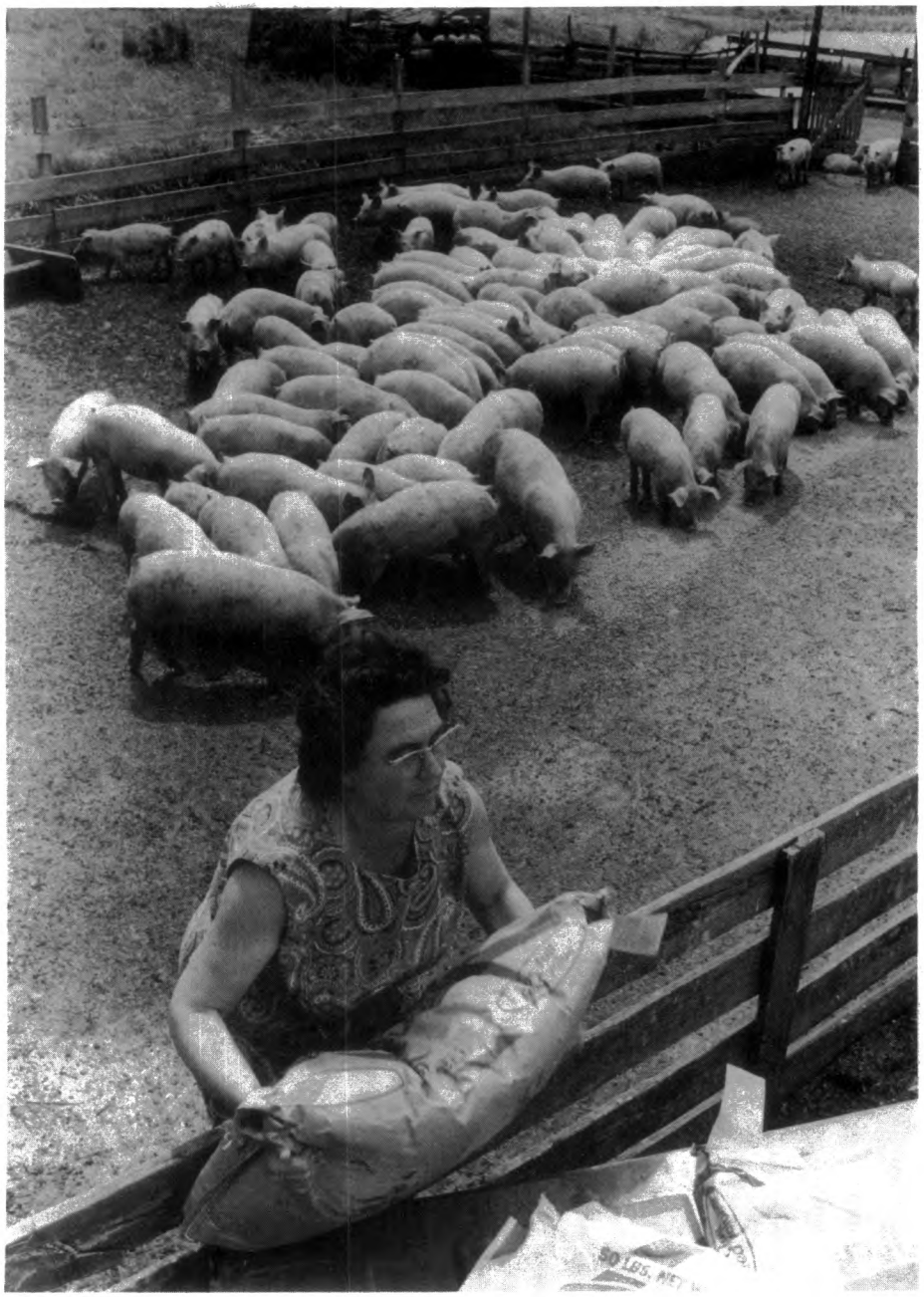
Cooperative Extension Services workers do educational work in areas such as agricultural production, community development, natural resource conservation, and home economics and may conduct agricultural educational programs through youth groups such as the 4-H Clubs.

Agricultural communications workers keep farmers and others concerned with agricultural production abreast of current developments in farm research and technology. Crop reporters and market news reporters are employed by the U.S. Department of Agriculture in field offices throughout the United States. Crop reporters gather information on crop production throughout the growing season. Market news reporters collect information on the movement of produce from farm to market.

Agricultural journalists, such as reporters and editors, collect farm news and data for publication in farm journals, magazines, bulletins, and for broadcast. Agricultural journalists also are employed as farm directors for radio and television broadcast stations in farming areas to report on prices, sales, crop conditions, and other agricultural information of importance to farm residents. Still others are employed in communications departments of agribusiness firms to develop advertisements and public relations bulletins.

**Management and Administration**. Many workers in managerial and administrative occupations must have a knowledge of agriculture. Agricultural accountants prepare and analyze financial reports for farmers and farm supply businesses such as dairy equipment stores and farm machinery stores. Agricultural financial experts work closely with farmers in making loans and ensuring borrowed money is put to constructive use. Agricultural marketing specialists survey wholesalers, retailers, and consumers; analyze data on products and sales; and prepare sales forecasts that food businesses use to make decisions relating to product design and advertising. Agricultural economists provide information about production, financing, and pricing to farmers, food processors and distributors, and government agencies.

**Production services**. As farms become larger and farming more complex, farmers increasingly rely on off-farm workers for livestock and crop services. Veterinarians, for example, provide health care services to livestock. They administer tests for animal diseases, conduct programs for disease eradication, and conduct research to develop vaccines for disease control.



On small farms, family members do much of the work.

Other service workers contract with farmers to do basic animal care chores. Cow testers employed by dairy herd improvement associations travel from farm to farm to test the milk from each cow in a herd for acidity and butterfat content. Sheep shearers contract to shear the wool from flocks of sheep. Poultry hatcheries employ several types of animal caretakers to vaccinate poultry, place eggs on trays in incubators, and care for baby chicks being used in experimental tests.

In addition to workers who supply animal services, others provide custom or general crop services. For example, agricultural pilots and their assistants mix agricultural chemicals and apply them to fields from the air. Also, some airplane mechanics are employed to repair and maintain agricultural aircraft.

**Sales and service**. Most types of farming require the use of large amounts of machinery, equipment, and other farm supplies such as chemicals and pesticides. As a result, there are many jobs for workers who sell, maintain, and explain how to use machinery and supplies. Farm equipment sales workers must know the needs of farmers in their area and stock the latest equipment and machinery to meet those needs. Farm equipment mechanics service and repair machinery. Agricultural chemical sales workers sell pesticides, herbicides, and fertilizers and help farmers use them effectively.

**Food processing**. Many workers are needed to prepare food for consumption. Meat and poultry inspectors, for example, are employed by the U.S. Department of Agriculture and by many State departments of agriculture. Working under the supervision of

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Scientific research is the foundation of increased agricultural production.

a veterinarian, they inspect meat and poultry slaughtering, processing, and packaging operations to insure that proper sanitation is maintained throughout all phases of processing. They also inspect meat additives and make sure that processed meats are labeled correctly.

Agricultural commodity graders inspect samples of agricultural products to determine their quality and grade, and then issue grading certificates. They generally specialize in one particular commodity, such as eggs, vegetables, fresh fruits, dairy products, or grain.

## Working Conditions

Many types of farming are seasonal in nature. Although many workers on crop farms work from sunup to sundown during the planting and harvesting seasons, they often work on the farm only 6 to 7 months a year, and many have second jobs off the farm.

On farms that raise animals for meat or dairy products, the work that goes on constantly throughout the year. Because animals must be fed and watered every day and cows must be milked twice daily, operators of these farms rarely get the chance to be away.

Farm work can be extremely hazardous; each year, many farm workers are injured by planting and harvesting machinery. Also, farm workers are subject to illnesses and diseases from handling and breathing dangerous pesticides and chemicals and from handling crops that have been sprayed with insecticides.

Working conditions in off-farm agricultural occupations vary greatly. Workers in research, education, administrative, and sales occupations generally work in a pleasant environment and have fairly regular hours. Others, however, may have to work in uncomfortable surroundings. For example, veterinarians sometimes work outdoors in bad weather. Meat cutters work in coldrooms designed to keep meat from spoiling. Some workers, such as agricultural pilots and farm equipment mechanics, work extra hours during planting and harvest periods.

## Employment

In 1980, there were about 1,447,000 farmers, 37,000 farm managers, and 1,205,000 farm laborers and supervisors.

The topography of the land and the climate of an area generally determine the type of farming that is done. For example, wheat, corn, and other grains are most efficiently grown on large, flat farms on which large and sophisticated machinery can best be used. Thus, these crops are ideal for the plains of Kansas, Nebraska, Iowa, and Illinois. Dairy herds are best suited for the areas of good pastureland, such as Wisconsin, Minnesota, and New York. Crops that require longer growing seasons, such as cotton, tobacco, and peanuts, are grown chiefly in the South. Most of the country's fruits and vegetables come from California, Texas, and Florida.

Raising fruits and vegetables, which must be picked and packaged by hand, generally requires a large number of employees during the harvesting season, and many hired laborers work on these farms on a seasonal basis. Many farm laborers and supervisors are employed in California, Texas, and Florida.

Much of the work on farms that produce animals and dairy products must be done daily throughout the year. These farms often rely on the farm operator and several family members to do most of the work. Unpaid family workers and farm operators also provide most of the labor on farms that produce crops, such as wheat, corn, or cotton, that can be machine harvested and packaged without damage. Therefore, only a small number of hired farm workers and almost no supervisors are employed in the regions that produce these farm products.

Off farm workers who need a background in agriculture are employed in almost all industries. However, jobs are concentrated in manufacturing, trade, agricultural services, and government. Food manufacturers, for example, employ agricultural scientists and technicians, agricultural marketing specialists, agricultural economists, farm product buyers and shippers, inspectors, graders, millers, and meat cutters and butchers.

## Training, Other Qualifications, and Advancement

Growing up on a family farm and participating in farming programs for young people, such as the Future Farmers of America or the

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4-H Clubs, is still an important source of training for prospective farmers. However, because of the scientific and business complexities of modern farming and the need to keep up with advances in farming methods, an increasing number of young people who live on farms find it desirable to attend a 2- or 4- year college of agriculture. A degree in agriculture is essential for persons who wish to become farmers or farm managers but who have not had the advantage of living or working on a farm.

Most colleges of agriculture offer major programs of study in areas such as dairy science, agricultural economics and business, horticulture, crop and fruit science, soil sciences, and animal sciences. Also, colleges usually offer special programs of study concerning products important to the area in which they are located, such as animal science programs at colleges in the Western and Plains States.

Many farm laborers can learn their jobs in a matter of hours on the farm and require little or no outside training. Some farm laborers perform specialized jobs, such as machine operator, for which experience is desirable.

Farm operators should be willing to try new processes and adapt to constantly changing technologies to produce their crops or raise their livestock more efficiently. Operators also must have enough technical knowledge of crops and growing conditions and plant and animal diseases to be able to make decisions that insure the sucessful operation of their farms. They also must have the managerial skills necessary to organize and operate a business. Mechanical aptitude and the ability to work with tools of all kinds also are valuable skills for the operator of a small farm who often must maintain and repair machinery or farm structures. A basic knowledge of accounting and bookkeeping can be helpful in keeping financial records, and a knowledge of credit sources is essential.

Farm laborers should be in excellent physical condition. They must perform work that is physically demanding such as lifting and carrying hay bales and restraining animals.

Opportunities for advancement for farm laborers are limited; however, they may advance to farm labor supervisors, and a few may have the opportunity to become working farm managers, or to one day own their own farms.

Agricultural accountants and bankers help farmers with financial planning.

Many farmworkers, like these students, work on the farm only part time.

Off-farm occupations requiring a background in agriculture vary greatly in knowledge and skill requirements, from professions requiring college training to jobs that may be learned in a few days or by merely growing up on a farm and observing the tasks being performed.

The minimum requirement for administrative, engineering, and scientific jobs is a bachelor's degree with an appropriate major. Four-year degree programs are offered in general agriculture, agronomy, soil science, animal sciences, agricultural economics, agricultural business, horticulture, food science, agriculture education, and agriculture engineering. Graduate programs leading to master's and doctoral degrees also are available in many of the same fields.

Many sales, technical, and service occupations can be learned by completing programs at technical schools or junior colleges. Programs are available in agricultural production, agricultural supply service, agricultural mechanics, and other specialties. Length of training varies by subject, from a few weeks to 2 years.

## Job Outlook

Opportunities for employment will vary among off-farm occupations, although job prospects generally will be better than for farm occupations. Demand for food and fiber will increase greatly as the world population grows. Meeting this growing demand will require the development and use of more productive farming methods, new farm machinery, and hybrid crops. The food processing and distribution systems also will grow to accomodate increased farm production.

The number of farmers is expected to decline as farms become more expensive to buy and operate. Both the average size of farms and the price of farmland have increased greatly in recent years, adding considerably to the cost of buying a farm. Operating

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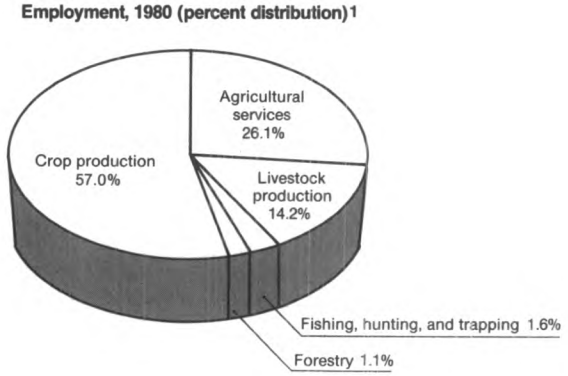
**Crop production accounts for about three-fifths of all agricultural employment**




1Wage and salary workers only
Source: Bureau of Labor Statistics

costs—livestock, feed, seed, fertilizer, machinery, and fuel—also have risen substantially, making large farms more economical than small ones. The trend toward fewer and larger farms is expected to continue, reducing the number of jobs for farm operators.

The high cost of buying and operating a farm has made it very difficult for people who do not belong to farm families to become farmers. However, people who want to become farmers may be able to start out as assistant managers or hired hands, thereby gaining experience and the opportunity to rent land and equipment from the landowner. In several years, they may be able to raise enough capital and have enough experience to obtain a loan and buy a small farm. Even if the beginning farmer rents rather than purchases land and buildings, financing is generally necessary to acquire livestock, seed, feed, fertilizer, and machinery, and to pay living expenses.

As farming becomes more complex, the demand for farm managers with specialized skills and knowledge will increase. The need for farm managers also may increase because people who inherit farms often do not want to work the land themselves. They may have farm managers to do the farmwork or to supervise tenant farmers.

Employment of farm laborers is expected to decline as the number of farms declines and as machinery replaces much of the work that laborers now do. As farms become larger, the additional use of more and larger machinery makes it unnecessary to hire more farm laborers.

## Earnings

Earnings of farm operators vary greatly from year to year and by type and size of farm. Prices of many farm products fluctuate greatly depending on weather conditions that determine the amount and quality of products that are produced. A farm that shows a large profit in one year may show a loss in the following year.

Farm laborers are generally among the lowest paid workers; in 1980, average hourly earnings of all hired farm workers were only $3.66. In comparison, average hourly earnings of all production workers in private nonagricultural industries were $6.66 in the same year. Average wage rates for hired farm workers ranged from $3.25 an hour for livestock workers to $5.59 an hour for farm labor supervisors. In general, workers paid on a piece-rate basis earned more than those who received a straight hourly wage. In addition to their wages, some hired farm workers receive room and board allowances; however, almost no farm workers receive paid vacations, sick leave, or health benefits.

Many farm laborers, especially those in California, are represented by the United Farmworkers Union (UFW); others are represented by the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers. Many farmers are members of local and regional cooperatives that enable them to reduce the cost of their supplies and to market their products.

Earnings in off-farm agricultural occupations vary greatly. Workers in agricultural businesses generally earn as much as workers with similar skills in nonagricultural industries. More detailed information about the work, working conditions, training requirements, job outlook, and earnings of many of the off-farm occupations discussed in this section can be found elsewhere in the *Handbook*.

## Sources of Additional Information

For general information about farming and other agricultural occupations, contact:

American Farm Bureau Federation, 225 Touky Ave., Park Ridge, Ill. 60068.

Future Farmers of America, P.O. Box 15160, Alexandria, Va. 22309.

Information Office or Office of Higher Education, U.S. Department of Agriculture, Washington, D.C. 20250. The Department also will answer phone requests; dial 202–447-2791.

National Association of State Universities and Land Grant Colleges, 1 Dupont Circle, Suite 710, Washington, D.C. 20036.

National 4-H Council, 7100 Connecticut Ave. NW., Washington, D.C. 20015.

For information about farm financing, contact:

Farm Credit Administration, Washington, D.C. 20578.

# Forestry Technicians

(D.O.T. 452 and 459.387)

## Nature of the Work

Forestry technicians, sometimes called forestry aides in entry level positions, assist foresters in the care and management of forest lands and their resources. Their duties are varied and include many forest protection, improvement, and production responsibilities. For example, in timber production, they may help estimate present and potential yield in a certain area. If new roads are needed to make the timber accessible for cutting and removal, technicians may supervise the surveying and road building crews. After the timber has been cut, they measure the logs to determine how much lumber they will yield and may assist in the sale of the timber.

Technicians work on many forest improvement projects. They inspect trees for disease and other problems, and record their findings. On watershed projects, they work to prevent flood damage and soil erosion and seek ways to preserve the quality of water in the forest.

Forestry technicians also help to prevent and control fires. They give fire prevention information to people using the forest and lead firefighting crews if a fire occurs. After fires are extinguished, they take inventory of burned areas and supervise the planting of new trees and shrubs to restore the forest.

Recreational use of forests has increased greatly. Technicians maintain forest areas for hunting, camping, hiking, and other recreational activities. They also explain forest regulations and policies to visitors and enforce these rules.

## Working Conditions

Forestry technicians do almost all of their work outdoors. They may have to work in all kinds of weather, and sometimes must work in remote areas for extended periods of time. In emergencies, such as when fighting fires or controlling floods, forestry technicians may have to work as many hours as they are physically able.

Much of the work is seasonal. The weather, for example, may make road building and other activities impossible during the winter

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months in certain areas of the country. Firefighting jobs usually are limited to the summer and fall fire seasons.

The work can be both physically and mentally demanding. In addition to the hazards of weather, forestry technicians must contend with snakes, mosquitoes, and other dangers and annoyances.

## Employment

An estimated 15,000 persons worked year round as forestry technicians in 1980. Nearly the same number found temporary employment—primarily with Federal and State governments—during the summer or in the spring and fall fire seasons.

Over half the year-round total worked in private industry, mainly for logging, lumber, and paper companies. Mining, oil, and railroad companies employed some forestry technicians on reforestation projects; tree nurseries employed others. The Federal Government employed about 4,000 full-time forestry technicians in 1980, primarily in the Forest Service of the U.S. Department of Agriculture, while many others worked for State governments.

## Training, Other Qualifications, and Advancement

Most persons qualify for beginning jobs as forestry technicians by completing a specialized course of study in a 1- or 2-year postsecondary school or through work experience on firefighting crews, in tree nurseries, or in recreation work.

Because of keen job competition at the present time, opportunities for employment are better for persons who have postsecondary school training. The Society of American Foresters recognized 53 of about 80 technical institutes, junior or community colleges, and universities which offered forestry technician training in 1980.

Most forestry technician schools require general education courses such as mathematics and English, forestry-related courses including biology and botany, and specialized forest technology courses such as land surveying, tree identification, aerial photograph interpretation, and timber harvesting. Most schools also provide practical experience working in a forest.

Enthusiasm for outdoor work, physical stamina, and the ability to carry out tasks with and without direct supervision are essential for success in this field. Technicians should be able to work with survey crews, users of forest lands, forest owners, and foresters. They must express themselves clearly when talking with others and when making written reports.

Forestry technicians generally begin work as trainees or in relatively routine positions under the direct supervision of an experienced technician or forester. As technicians gain experience, they are given more responsibility, and often move into supervisory positions. Some technicians obtain bachelor's degrees in forestry and are promoted to the forester level.

## Job Outlook

Growth in employment of forestry technicians is expected to be about as fast as the average for all occupations through the 1980's. Private industry should continue to provide a high proportion of these jobs.

Environmental concern, a rising demand for forest products, and increased use of technology in the forest industry are expected to stimulate the need for more technicians each year. Increasingly, technicians will take on many of the more routine jobs done by foresters.

Despite this expected growth, keen competition for jobs is anticipated. Currently, the number of persons seeking employment as forestry technicians greatly exceeds the jobs available. Unless the number of graduates of forestry technician schools declines substantially in the future, competition for jobs is expected to persist. Applicants who have had specialized forestry technician training and some practical experience should have the best opportunities for employment.

## Earnings

Starting salaries of forestry technicians ranged from $10,000 to $12,000 a year in 1980, according to the limited data available; experienced forestry technicians averaged about $16,000.

In the Federal Government, forestry technicians usually started at $10,963 a year in early 1981.

Many forestry technicians are employed only during forest-fire seasons.

## Related Occupations

Forestry technicians work mostly outdoors, usually in a natural setting. Other workers who have a similar job environment include farmworkers, fishers, loggers, shellfish bed workers, and trappers.

## Sources of Additional Information

Information about a career in the Federal Government as a forestry technician is available from:

U.S. Department of Agriculture, Forest Service, P.O. Box 2417, Washington, D.C. 20013.

For a list of schools recognized by the Society of American Foresters offering training in the field, write to:

Society of American Foresters, 5400 Grosvenor Lane, Washington, D.C. 20014.

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# Mechanics and Repairers

In our technologically advanced society, machines of one type or another touch almost all aspects of our lives. Industrial machinery produces our goods. Transportation equipment carries both goods and people anywhere in the world. Telephones and other communication equipment convey information quickly and efficiently. Appliances make our household chores easier. Mechanics and repairers maintain and repair these and the many other types of machines we rely on.

One-fourth of all mechanics and repairers work on motor vehicles in occupations such as automobile mechanic, truck or bus mechanic, and automobile body repairer. The remaining three fourths work on a variety of machines in occupations such as appliance repairer, computer service technician, telephone repairer, locksmith, and piano repairer. The accompanying table presents 1980 employment estimates for selected occupations in this group.

**Table 1. Employment in selected mechanic and repairer occupations, 1980**

| Occupation | Employment |
|---|---|
| Automotive mechanic | 846,000 |
| Maintenance mechanic | 348,000 |
| Telephone installer and repairer | 248,000 |
| Air-conditioning, heating, and refrigeration mechanic | 179,000 |
| Diesel mechanic | 174,000 |
| Electric power line installer and repairer | 172,000 |
| Auto body repairer | 153,000 |
| Aircraft mechanic | 109,000 |
| Engineering equipment mechanic | 92,000 |
| Millwright | 91,000 |
| Radio and television repairer | 83,000 |
| Data processing machine mechanic | 83,000 |
| Gas and electric appliance repairer | 60,000 |
| Office machine and cash register servicer | 55,000 |
| Oiler | 41,000 |
| Instrument repairer | 38,000 |
| Railroad car repairer | 30,000 |
| Coin machine servicer | 27,000 |
| Farm equipment mechanic | 25,000 |
| Electric motor repairer | 20,000 |

SOURCE: Bureau of Labor Statistics.

Mechanics and repairers work in all industries in the economy. Almost one-fifth work in manufacturing industries—the majority in plants that produce durable goods such as steel, automobiles, and aircraft. Another one-fifth work in retail trade—mainly in firms that sell and service automobiles, household appliances, farm implements, and other mechanical equipment. About one-seventh work in shops that service machines of all types. Most of the remaining mechanics and repairers work for transportation, construction, and public utilities companies, and all levels of government.

Training for most mechanic and repairer occupations requires both classroom instruction in machine operation and practice in repair work. Mechanics get this training through high school and postsecondary programs and on-the-job training.

For almost all the mechanic and repairer occupations, employers prefer high school graduates. Courses in shop math, blueprint reading, drafting, woodworking, metalworking, and electronics give students basic mechanical knowledge and skills.

Training in specific areas—appliance repair, automobile maintenance and repair, television repair—is available through high schools, private vocational schools, community colleges, correspondence schools, and the Armed Forces. These vocational programs include instruction in machine operation and experience with actual or demonstration machinery. Although completion of such training does not assure a job, employers increasingly prefer to hire people with some training or experience.

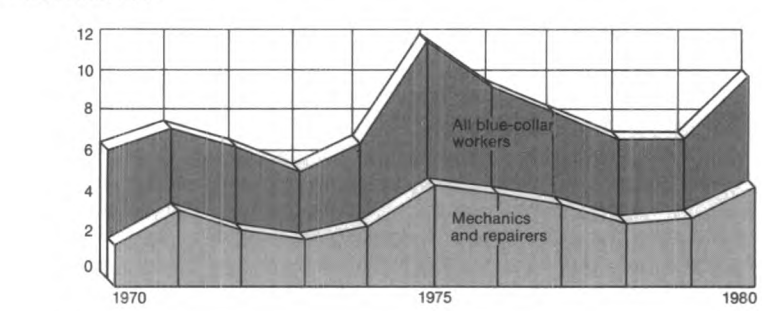
New mechanics and repairers usually receive on-the-job training from their employer. This training may involve classroom instruction and practice work with demonstration machines. However, it frequently consists only of supervision by an experienced worker.

To keep up with improved technology, mechanics and repairers must continue their training throughout their careers. They study the repair books and technical manuals that accompany new equipment, and attend classes run by equipment manufacturers.

Physical requirements for work in this field vary greatly. For example, telephone lineworkers must be strong and agile to lift heavy equipment and work in awkward positions. Watch repairers need good vision and excellent finger dexterity. For occupations in which the repairer deals with customers, the ability to work with people is important. For most mechanic occupations, advancement is limited to supervisory positions. Some of these occupations, however, offer good opportunities for self-employment.

Employment of mechanics and repairers as a whole is expected to increase about as fast as the average for all occupations through the 1980's. Contributing to the growing need for mechanics and repairers will be the increased use of household appliances, automobiles, computers, and complex industrial machinery. In addition to jobs created by growth in demand for maintenance and repair work many thousands of openings will arise in this relatively large occupational category as experienced workers transfer to other fields, retire, or die.

**The unemployment rate for mechanics and repairers is much lower than the rate for blue-collar workers as a whole**




Source: Bureau of Labor Statistics

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# Vehicle and Mobile Equipment Mechanics and Repairers

Vehicle and mobile equipment mechanics and repairers maintain and repair automobiles, motorcycles, trucks, buses, boats, and airplanes, as well as construction, logging, railroad and farm equipment.

Mechanical aptitude and manual skills are essential to vehicle and mobile equipment mechanics and repairers. They also need reading and writing skills in order to consult repair and technical manuals, read work orders, and write parts lists and descriptions of the work they perform. They must be able to work efficiently and with precision since their earnings often depend on how rapidly they can correctly perform maintenance or repairs. They must also be capable of handling heavy or unwieldy parts or components.

Employers usually prefer to hire high school graduates, but frequently hire those without high school diplomas if they can read and write adequately. Most mechanics and repairers acquire their skills on the job following the instructions of experienced workers, reading repair manuals, and solving problems on their own. Formal mechanic training acquired in high school, vocational or technical school, or in the Armed Forces is an asset to persons entering mechanic and repairer careers.

This section describes seven motor vehicle mechanic and repairer occupations: Airplane mechanics, automobile body repairers, automobile mechanics, boat-engine mechanics, farm equipment mechanics, motorcycle mechanics, and truck and bus mechanics. Other mechanic and repairer careers are described in subsequent sections.

## Aircraft Mechanics

(D.O.T. 621.281-014)

### Nature of the Work

Most travelers hardly think twice about flying thousands of feet above the ground. The confidence they have in aircraft is a tribute to the mechanics who maintain them. To keep aircraft in top operating condition, mechanics perform scheduled maintenance, make repairs, and complete inspections required by the Federal Aviation Administration (FAA).

Many mechanics specialize in scheduled maintenance. Following a schedule that is based on the number of hours flown, calendar days, or a combination of these factors, mechanics inspect the engines, landing gear, instruments, and other parts of the aircraft and do the necessary maintenance. For example, they may examine an engine through specially designed openings while working from ladders or scaffolds, or use hoists or lifts to remove the entire engine from the craft. After taking the engine apart, mechanics may use sensitive instruments to measure parts for wear, and use X-ray and magnetic inspection equipment to check for invisible cracks. Worn or defective parts are replaced. They also may repair sheet-metal surfaces, measure the tension of control cables, or check for rust, distortion, and cracks in the fuselage and wings. Mechanics test the equipment to make sure the repairs were made properly.

Mechanics specializing in repair work use the pilot's description of a problem to find and fix faulty equipment. For example, during a preflight check, a pilot may discover that the aircraft's gas gauge does not work. To solve the problem, mechanics may check the electrical connections, replace the gauge, or use electrical test equipment to make sure no wires are broken or shorted. They work as fast as safety permits so that the aircraft can be put back into service quickly.

Mechanics may work on one or many different types of aircraft, such as jets, propeller-driven airplanes, and helicopters, or for efficiency, may specialize in one section of a particular type of aircraft, such as the engine or electrical system. Mechanics employed by companies that own their own aircraft usually must handle all repair and maintenance work. In small, independent repair shops, mechanics usually inspect and repair many different types of aircraft.

### Working Conditions

Mechanics usually work in hangars or in other indoor areas. However, if the hangars are full or if repairs must be made quickly, they may work outdoors, sometimes in unpleasant weather. This occurs most often to airline mechanics who work at airports because, to save time, minor repairs and preflight checks often are made at the terminal. Mechanics often work under the pressure of time to maintain flight schedules or, in general aviation, to keep from inconveniencing customers. At the same time, mechanics must maintain safety standards.

Frequently, mechanics must lift or pull as much as 50 pounds. They often stand, lie, or kneel in awkward positions and occasionally must work in precarious positions on scaffolds or ladders. Noise and vibration are common when testing engines. Aircraft mechanics generally work 40 hours a week on 8-hour shifts around the clock.

### Employment

About 109,000 aircraft mechanics were employed in 1980, including about 16,000 who worked in aircraft assembly firms. Over 40 percent worked for airlines and about 25 percent worked for the Federal Government. Most of the rest were general aviation mechanics, the majority of whom worked for independent repair shops or companies that operate their own planes to transport executives and cargo.

Most airline mechanics work near large cities at the airlines' main stops. Many employees of the Federal Government are civilians employed by the military and work at military aviation installations. Others work for the FAA, many in the headquarters at Oklahoma City. Mechanics for independent repair shops work at airports in every part of the country.

### Training, Other Qualifications, and Advancement

The majority of mechanics who work on civilian aircraft are licensed by the FAA as "airframe mechanics," "powerplant mechanics," or "aircraft inspectors." Airframe mechanics are qualified to work on the fuselage, wings, landing gear, and other structural parts of the plane; powerplant mechanics are qualified only for work on the engine. Combination airframe-and-powerplant mechanics can work on any part of the plane, and those with an inspector's license can certify inspection work completed by other mechanics. Unlicensed mechanics are supervised by those with licenses.

The FAA requires at least 18 months of work experience for an airframe or powerplant license. For a combined license, at least 30 months of experience working with both engines and airframes are required. To obtain an inspector's license, a mechanic must have held an airframe-and-powerplant license for at least 3 years. Applicants for all licenses also must pass written and oral tests and demonstrate that they can do the work authorized by the license.

Although a few people become mechanics through on-the-job training, most learn their job in the Armed Forces or in trade schools certified by the FAA. Courses in these trade schools last from 18 months to 2 years and provide training with the tools and equipment used on the job. For an FAA license, attendance at such schools may substitute for work experience. However, these schools do not guarantee jobs or FAA licenses.

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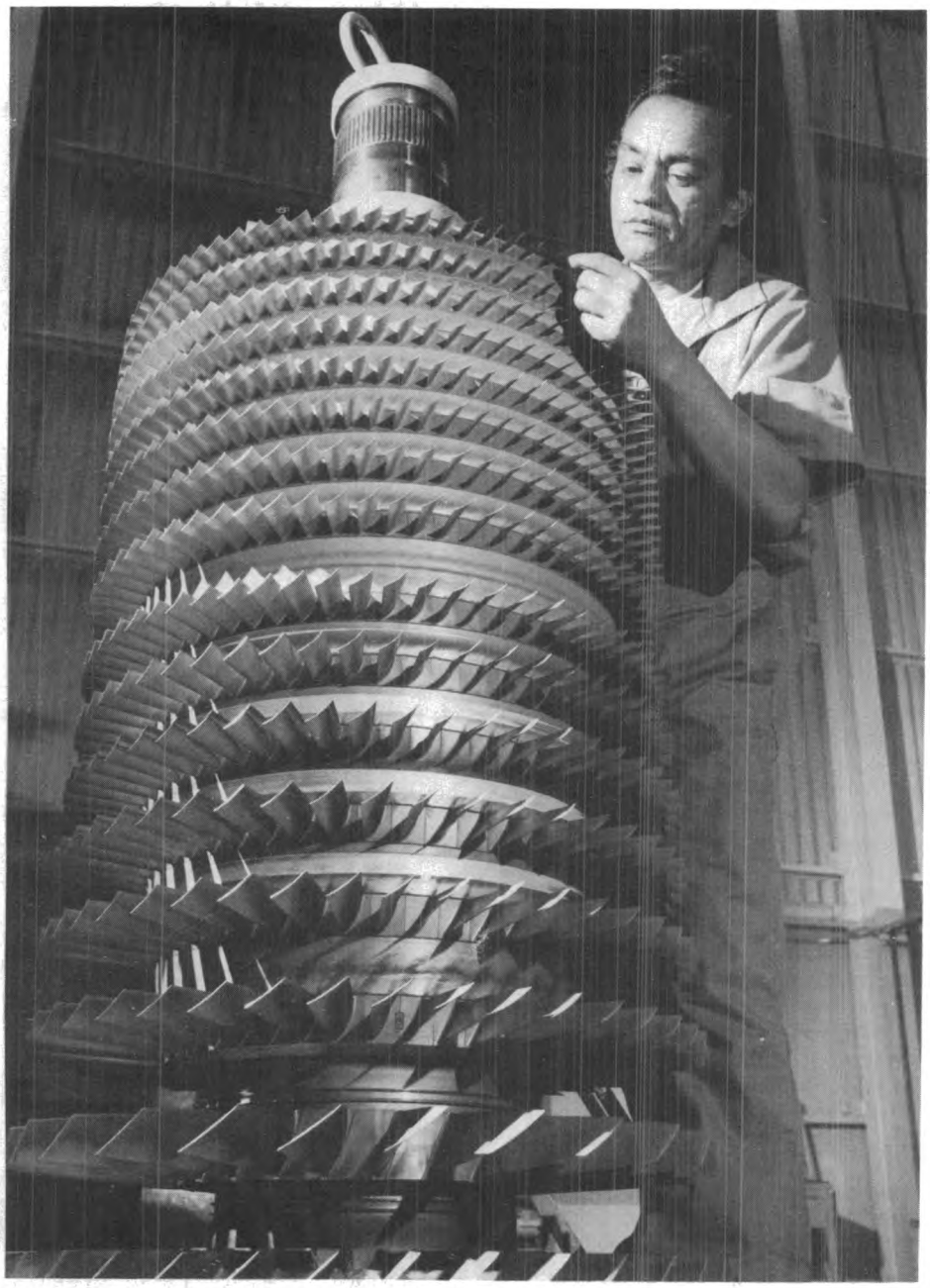

Jet engine mechanics help make air travel safe.

Some aircraft mechanics in the Armed Forces acquire enough general experience to satisfy the work experience requirements for the FAA license. With additional study they may pass the licensing exam. Generally, however, jobs in the military services are too specialized to provide the broad experience required by the FAA. Most have to complete the entire training program at a trade school, although a few receive some credit for the material they learned in the service. Military experience is an asset when seeking employment, however; employers consider trade school graduates who have this experience to be the most desirable applicants.

A high school diploma or its equivalent is necessary for all prospective aircraft mechanics. Courses in mathematics, physics, chemistry, and mechanical drawing are helpful because knowledge of the principles involved in the operation of an aircraft often is necessary to make repairs.

Aircraft mechanics must do careful and thorough work and have the strength to lift heavy parts and tools. Agility is important for the reaching and climbing necessary for the job. Aircraft mechanics must not be afraid of heights since they work on the top of wings and fuselages on large jet planes. As new and more complex airplanes are designed, mechanics must update their skills.

As aircraft mechanics gain experience, they advance to more responsible jobs. Opportunities are best for those who have an airframe-and-powerplant license, as well as an aircraft inspector's license. A mechanic may advance to head mechanic (or crew chief), to inspector, to head inspector, and to shop supervisor. In the airlines, a few supervisors may advance to executive positions. With additional business training, some may open their own repair shops.

## Job Outlook

The number of aircraft mechanics is expected to increase about as fast as the average for all occupations through the 1980's. In addition to jobs resulting from growth in demand for these workers, many openings will arise from the need to replace mechanics who transfer to other fields of work, retire, or die. However, job opportunities in general aviation, airline companies, and the Federal Government will differ.

Job opportunities in general aviation are expected to be good, particularly for qualified mechanics who are willing to relocate. The number of private aircraft as well as the number used by companies for executive transportation is expected to grow rapidly. Since wages in small companies frequently are low, there is less competition for these jobs than in the airlines. Also, some jobs will become available as experienced mechanics leave for better paying jobs with airlines or large private companies.

In contrast with general aviation, competition for airline jobs will be keen because the high wages attract more qualified applicants than there are jobs available. A growing population and rising incomes are expected to increase the demand for airline transportation.

Little change in the number of mechanics employed by the Federal Government is expected. Opportunities will fluctuate with changes in defense spending.

Declines in air travel during recessions force airlines to curtail the number of flights. Fewer flights mean less aircraft maintenance and consequently layoffs for aircraft mechanics.

## Earnings

In 1980, annual earnings of aircraft mechanics who worked on jets averaged $19,900, according to an American Management Associations' survey. Mechanics who worked on other aircraft averaged $18,300 a year. Chief mechanics who worked on jets averaged $23,900 annually, while those working on other aircraft averaged $23,000. Beginning mechanics usually earned between $15,000 and $16,000 a year. Airline mechanics and their immediate families receive reduced fare transportation with their own and most other airlines.

Mechanics employed by most major airlines are covered by union agreements. Their earnings generally are higher than mechanics working for other employers. The principal unions in this field are the International Association of Machinists and Aerospace Workers, and the Transport Workers Union of America. Some mechanics are represented by the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America.

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## Related Occupations

Some other occupations that involve similar mechanical and electrical work are automotive-body repairers, automobile mechanics, electricians, elevator repairers, and telephone maintenance mechanics.

## Sources of Additional Information

For general information about aircraft mechanics, write to:

Aviation Maintenance Foundation, P.O. Box 739, Basin, Wyo. 82410.

For further information, request *Aviation Maintenance*, publication GA-300-133, (enclose a self-addressed mailing label) from:

U.S. Government Printing Office, Library and Statutory Distribution Service, 5208 Eisenhower Ave., Alexandria, Va. 22304.

Information about jobs in a particular airline may be obtained by writing to the personnel manager of the company. For addresses of airline companies, write to:

Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

For information on jobs in a particular area, contact employers at local airports or local offices of the State employment service.

# Automobile Body Repairers

(D.O.T. 620.684-034, 807.281-010, .381-010, and .684-010)

## Nature of the Work

Thousands of motor vehicles are damaged in traffic accidents every day. Although some are wrecked, most can be made to look and drive like new. Automobile body repairers straighten bent frames, remove dents, and replace crumpled parts that are beyond repair. Usually, they can fix all types of vehicles, but most repairers work on cars and small trucks. A few work on large trucks, buses, or tractor trailers.

When a damaged vehicle is brought into the shop, body repairers generally receive instructions from their supervisors, who have determined which parts are to be restored or replaced and how much time the job should take.

Automobile body repairers use special machines to restore damaged frames and body sections to their original shape and location. They chain or clamp the frames and sections to alignment machines that usually use hydraulic pressure to align the damaged metal.

Body repairers remove badly damaged sections of body panels with a pneumatic metal-cutting gun or acetylene torch and weld in new sections to replace them. Repairers push out less serious dents with a hydraulic jack or hand prying bar, or knock them out with handtools or pneumatic hammers. They smooth out small dents and creases by holding a small anvil against one side of the damaged area while hammering the opposite side. They remove very small pits and dimples with pick hammers and punches.

Body repairers also repair or replace the plastic body parts increasingly being used on newer model automobiles. They remove the damaged panels, and determine the type of plastic from which they are made. With most types they can apply heat using a hot air welding gun or immersion in hot water, and press the softened panel back into its original shape by hand. They replace parts made of plastic which are more difficult to repair.

Body repairers use plastic or solder to fill small dents which cannot be worked out of the plastic or metal panel. On metal panels, they then file or grind the hardened filler to the original shape and sand it to prepare it for painting. In many shops, automobile painters do the painting. (These workers are discussed elsewhere in the *Handbook*.) In smaller shops workers often do both body repairing and painting. Some body repairers also replace safety glass. A few specialize in repairing fiberglass bodies.

Body repair work has variety and challenge—each damaged vehicle presents a different problem. Repairers must develop appropriate methods for each job, using their broad knowledge of automobile construction and repair techniques.

Body repairers usually work by themselves with only general directions from supervisors. In some shops, they may be assisted by helpers or apprentices. In large shops, body repairers may specialize in one type of repair, such as frame straightening or door and fender repairing.

## Working Conditions

Automobile body repairers work indoors in body shops which are noisy because of the banging of hammers against metal and the whir of power tools. Most shops are well ventilated, but often they are dusty and smell of paint. Body repairers often work in awkward or cramped positions, and much of their work is strenuous and dirty. Hazards include cuts from sharp metal edges, burns from torches and heated metal, and injuries from power tools.

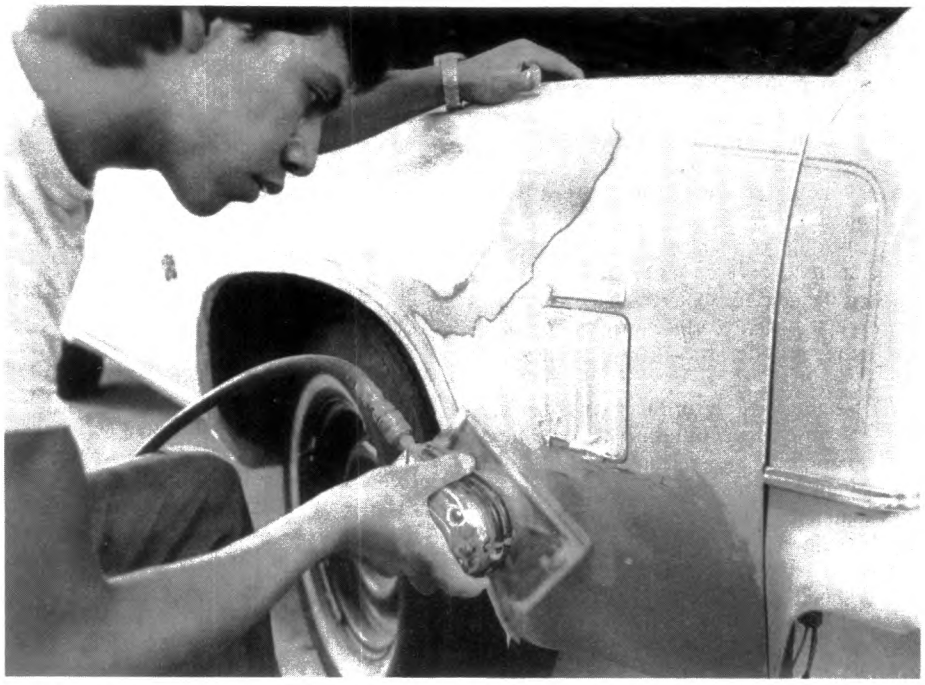
## Employment

More than 150,000 persons worked as automobile body repairers in 1980. Most worked for shops that specialized in body repairs and painting, and for automobile and truck dealers. Others worked for organizations that maintain their own motor vehicles, such as trucking companies and buslines. A few worked for motor vehicle manufacturers. Nearly 1 automobile body repairer out of 4 was self employed; most of these operated their own shop.

Automobile body repairers work in every section of the country. Jobs are distributed in about the same way as the population.

## Training, Other Qualifications, and Advancement

Most automobile body repairers learn the trade on the job. They usually start as helpers and pick up skills from experienced workers. Helpers begin by assisting body repairers in tasks such as removing damaged parts and installing repaired parts. They learn to remove small dents and to make other minor repairs. They then progress to more difficult tasks such as straightening frames. Generally 3 to 4 years of on-the-job training are needed to become skilled in all aspects of body repair. Most training authorities recommend a 3- or 4-year formal apprenticeship program as the best way to learn the trade, but rela-



Auto body repairers fill small dents with plastic or solder and then sand the surface.

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tively few of these programs are available. Apprenticeship includes both on-the-job training and classroom instruction. Apprentices spend most of their time learning on the job, but they also attend classes in related subjects such as mathematics, job safety procedures, and business management.

Persons who want to learn this trade should be in good physical condition and know how to use tools. Courses in automobile body repair offered by high schools, vocational schools, and private trade schools provide helpful experience, as do courses in automobile mechanics. Although completion of high school generally is not a requirement, many employers prefer to hire high school graduates.

Voluntary certification by the National Institute for Automotive Service Excellence is recognized as a standard of achievement for automobile body repairers. To be certified, a body repairer must pass a written examination and must have at least 2 years experience in the trade. Completion of a high school, vocational school, or trade school program in automobile body repair may be substituted for 1 year of work experience. Automobile body repairers must retake the examination at least every 5 years to continue to be certified.

Automobile body repairers must buy their own tools, but employers sometimes furnish power tools. Trainees generally accumulate tools as they gain experience, and many workers have hundreds of dollars invested in tools.

An experienced automobile body repairer with supervisory ability may advance to shop supervisor. Many workers open their own body repair shops. A few become automobile damage appraisers for insurance companies.

## Job Outlook

Employment of automobile body repairers is expected to increase about as fast as the average for all occupations through the 1980's, as the number of motor vehicles damaged in traffic grows. Accidents are expected to increase as the number of motor vehicles grows, although better highways, driver training courses, and improved bumpers and safety features on new vehicles may slow the rate of increase.

In addition to new jobs arising from increased demand for repairers, many openings are expected each year as experienced repairers retire, transfer to other occupations or die.

The automotive repair business is not very sensitive to changes in economic conditions, and experienced body repairers are rarely laid off. Major body damage must be repaired if an automobile is to be restored to safe operating condition. However, repair of minor dents and crumpled fenders can often be deferred should family budgets be strained during a recession. As a result, the automotive body repair business may suffer a small decline during an economic downswing. When business does decline, most employers hire fewer new workers. Thus, persons seeking to enter this occupation may face increased competition for jobs during recessions.

## Earnings

Body repairers employed by automobile dealers in 23 large cities had estimated average hourly earnings of about $10.90 in 1980, about one and two-thirds times the average for all nonsupervisory workers in private industry, except farming. Helpers and trainees usually earn from 30 to 60 percent of the earnings of skilled workers.

Many body repairers employed by automobile dealers and repair shops are paid a commission, usually about half of the labor cost charged to the customer. Under this method, earnings depend on the amount of work assigned to the repairer and how fast it is completed. Employers frequently guarantee commissioned workers a minimum weekly salary. Helpers and trainees usually receive an hourly rate until they are skilled enough to work on commission. Body repairers who work for trucking companies, buslines, and other organizations that maintain their own vehicles usually receive an hourly wage. Most body repairers work 40 to 48 hours a week.

Many automobile body repairers are members of unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.). Most body repairers who are union members work for large automobile dealers, trucking companies, and buslines.

## Related Occupations

Repairing damaged motor vehicles often involves working on their mechanical components as well as their bodies. Automobile body repairers often work closely with the following related occupations: Automobile repair service estimators, mechanics, painters and body customizers, and truck and bus mechanics.

## Sources of Additional Information

More details about work opportunities may be obtained from automobile body repair shops and automobile dealers; locals of the unions previously mentioned; or the local office of the State employment service. The State employment service also is a source of information about apprenticeship and other training programs.

For general information about the work of automobile body repair workers and apprenticeship training, write to:

Automotive Service Industry Association, 444 North Michigan Ave., Chicago, Ill. 60611.

Automotive Service Councils, Inc., 188 Industrial Dr., Suite 112, Elmhurst, Ill. 60126.

National Institute for Automotive Service Excellence, 1825 K St. N.W., Washington, D.C. 20006.

# Automobile Mechanics

(D.O.T. 619.380-018; 620-261-010 and -012; .281-010, -026, -034, -038, -046, -062, -066, and -070; .364-010; .381-010 and-022; .584-010; .664-014; .682-010; .684-014 through -026; 706.381-046; 721.281-010; 806.684-118; 807.664-010; 825.281-022 and .381-014

## Nature of the Work

Anyone whose car has broken down knows the importance of the automobile mechanic's job. The ability to make a quick and accurate diagnosis, one of the mechanic's most valuable skills, requires good reasoning ability and a thorough knowledge of automobiles. In fact, many mechanics consider diagnosing "hard to find" troubles one of their most challenging and satisfying duties.

When mechanical or electrical troubles occur, mechanics first get a description of the symptoms from the owner or, if they work in a dealership, the repair service estimator who wrote the repair order. The mechanic may have to test drive the car or use testing equipment, such as motor analyzers, spark plug testers, or compression gauges, to locate the problem. Once the cause of the problem is found, mechanics make adjustments or repairs. If a part is damaged or worn beyond repair, or cannot be fixed at a reasonable cost, they replace it.

Automobile mechanics use a variety of tools in their work. They use power tools such as pneumatic wrenches to remove bolts quickly; machine tools such as lathes and grinding machines to rebuild brakes and other parts; welding and flame cutting equipment to remove and repair exhaust systems and other parts; jacks and hoists to lift cars and engines; and common handtools such as screwdrivers, pliers, and wrenches to work on small parts and get at hard-to-reach places.

Most automobile mechanics perform a variety of repairs; others specialize. For example, *automatic transmission mechanics* work on gear trains, couplings, hydraulic pumps, and other parts of automatic transmissions. Because these are complex mechanisms, their repair requires considerable experience and training, including a knowledge of hydraulics. *Tune-up mechanics* adjust the ignition timing and valves, and adjust or replace spark plugs, distributor points, and other parts to ensure efficient engine performance. They often use scientific test equipment to help them adjust and locate malfunctions in fuel, ignition, and emissions control systems.

*Automobile air-conditioning mechanics* install air-conditioners and service components such as compressors and condensers. *Front-end mechanics* align and balance wheels and

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repair steering mechanisms and suspension systems. They frequently use special alignment equipment and wheel-balancing machines. *Brake repairers* adjust brakes, replace brake linings, repair hydraulic cylinders, and make other repairs on brake systems. Some mechanics specialize in both brake and front-end work.

*Automobile-radiator mechanics* clean radiators with caustic solutions, locate and solder leaks, and install new radiator cores. They also may repair heaters and air-conditioners, and solder leaks in gasoline tanks.

*Automobile electricians* repair and overhaul electrical systems and components. They may use electricians handtools to repair or replace defective wiring and rebuild electrical units, such as starters and generators. To locate electrical system malfunctions, they often use ammeters, ohmmeters, and voltmeters.

To prevent breakdowns, mechanics check parts and adjust, repair, or replace them before they go bad. Mechanics usually follow a checklist to be sure they examine all important parts, such as belts, hoses, steering systems, spark plugs, brake systems, carburetor, wheel bearings, and other potentially troublesome items.

## Working Conditions

Generally, mechanics work indoors. Modern automobile repair shops are well ventilated, lighted, and heated, but older shops may not be. Mechanics frequently work with dirty and greasy parts, and in awkward positions. They often must lift heavy parts and tools. Minor cuts and bruises are common, but serious accidents may be avoided when the shop is kept clean and orderly and safety practices are observed.

## Employment

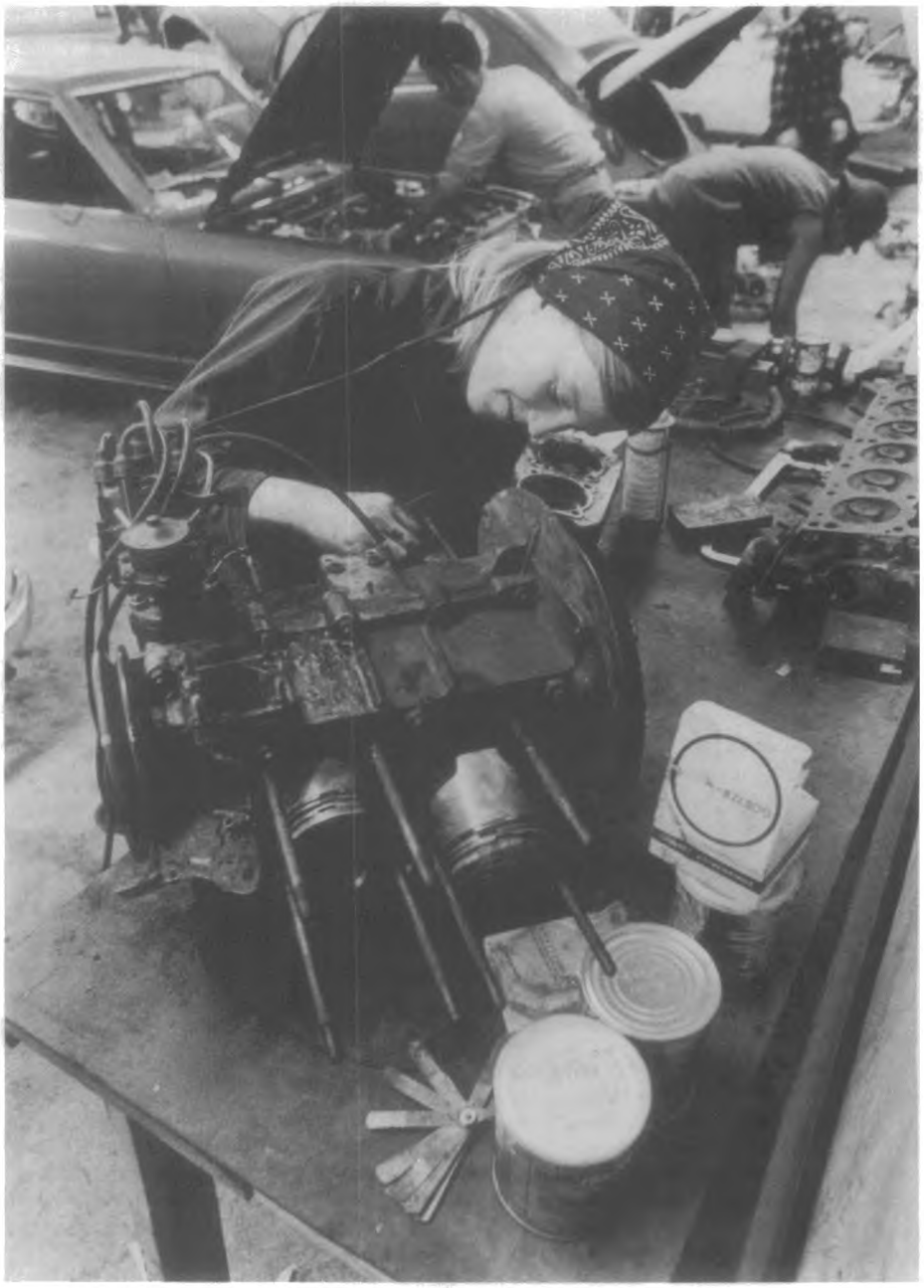
More than 845,000 persons worked as automobile mechanics in 1980. Most worked for automobile dealers, automobile repair shops, gasoline service stations, and department stores that have automobile service facilities. Others were employed by Federal, State, and local governments, taxicab and automobile leasing companies, and other organizations that repair their own automobiles. Automobile manufacturers employ some mechanics to adjust and repair cars at the end of assembly lines.

Most automobile mechanics work in shops that employ from 1 to 5 mechanics, but some of the largest shops employ more than 100. Generally, automobile dealer shops employ more mechanics than independent shops.

Automobile mechanics work in every section of the country. Geographically, employment is distributed about the same as the population.

## Training, Other Qualifications, and Advancement

Most automobile mechanics learn the trade on the job. Beginners usually start as helpers, lubrication workers, or gasoline station attendants, and gradually acquire skills by working with experienced mechanics. Although a beginner can make simple repairs after a few months' experience, it usually takes 1 to 2 years of experience to become a service mechanic and make the more difficult types of routine service and repairs. An additional 1 to 2 years are usually required to reach the journey level and become familiar with all types of repairs. An additional year or two is necessary to learn a difficult specialty, such as automatic transmission repair. In contrast, radiator mechanics and brake specialists, who do not need an all-round knowledge of automobile repair, may learn their jobs in about 2 years.



Automobile mechanics frequently work with dirty, greasy parts.

Most training authorities recommend a 3- or 4-year formal apprenticeship program. Apprenticeship programs are offered through many auto dealers and independent repair shops. Typical 4-year apprenticeship programs consist of about 8,000 hours of shop training to obtain practical experience working on brakes, chassis, transmissions, engines, electrical systems, exhaust emission controls, and other components. Programs usually require that at least 576 of these hours consist of formal instruction about these subjects and topics such as motor theory, use of blueprints and shop manuals, and safety.

For entry jobs, employers look for people with mechanical aptitude and a knowledge of automobiles. Experience working on cars in the Armed Forces or as a hobby is valuable. Completion of high school is also an advantage in obtaining an entry job. Courses in automobile repair offered by many high schools, vocational schools, community and junior colleges, and private trade schools are

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helpful, particularly if one also has work experience related to automotive service. Courses in physics, chemistry and mathematics can help a person better understand how an automobile operates.

Mechanics usually buy their handtools and beginners are expected to accumulate tools as they gain experience. Many experienced mechanics have hundreds of dollars invested in tools. Employers furnish power tools, engine analyzers, and other test equipment.

Employers sometimes send experienced mechanics to factory training centers to learn to repair new models or to receive special training in automatic transmission or air-conditioning repair. Automobile dealers may also send promising beginners to factory-sponsored mechanic training programs. Factory representatives come to many shops to conduct short training sessions. Mechanics also must read service and repair manuals to keep abreast of new technology.

Voluntary certification by the National Institute for Automotive Service Excellence is widely recognized as a standard of achievement for automobile mechanics. Mechanics are certified in one or more of eight different service areas, such as tune-ups, brake and front end work, or electrical system repair. General automobile mechanics are certified in all eight different areas. For certification in each area, mechanics must have at least 2 years of experience and pass a written examination; completion of an automobile mechanic program in high school, vocational or trade school, or community or junior college may be substituted for 1 year of experience. Certified mechanics must retake the examination at least every 5 years.

Experienced mechanics who have leadership ability may advance to shop supervisor or service manager. Mechanics who work well with customers may become automobile repair service estimators. About 1 out of 6 automobile mechanics is self-employed in his or her own repair shop or service station.

## Job Outlook

Job opportunities for automobile mechanics will be plentiful in the years ahead. Replacement needs are high in this large occupation. Thousands of job openings will arise each year as experienced mechanics retire, die, or change jobs. Additional openings will occur as employment grows.

Employment of automobile mechanics is expected to increase faster than the average for all occupations through the 1980's. The number of mechanics is expected to increase because expansion of the driving age population and rising consumer purchasing power will increase the number of automobiles on the road. Employment also is expected to grow because more automobiles will have pollution control and safety devices, air-conditioning, and other features that require maintenance.

Most persons who enter the occupation may expect steady work because changes in economic conditions have little effect on the automobile repair business. During a downturn, however, some employers may be more reluctant to hire inexperienced workers.

## Earnings

Highly skilled journey automobile mechanics employed by automobile dealers in 24 cities had estimated average hourly earnings of $9.78 in 1980, about one and one-half times the average for all nonsupervisory workers in private industry, except farming. Skilled service mechanics had estimated average hourly earnings of $7.16 and lubricators averaged an estimated $6.41 an hour in 1980.

Many experienced mechanics employed by automobile dealers and independent repair shops receive a commission related to the labor cost charged to the customer. Under this method, weekly earnings depend on the amount of work completed by the mechanic. Employers frequently guarantee commissioned mechanics a minimum weekly salary.

Most mechanics work between 40 and 48 hours a week, but many work even longer hours during busy periods.

Some mechanics are members of labor unions. The unions include the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.).

## Related Occupations

Other workers who repair and service motor vehicles include automobile body repairers, customizers, painters, and repair service estimators as well as truck and bus mechanics.

## Sources of Additional Information

For more details about work opportunities, contact local automobile dealers and repair shops; locals of the unions previously mentioned; or the local office of the State employment service. The State employment service also may have information about apprenticeship and other training programs.

For general information about the work of automobile mechanics and apprenticeship training, write to:

Automotive Service Industry Association, 444 North Michigan Ave., Chicago, Ill. 60611.

Automotive Service Councils, Inc., 188 Industrial Dr., Suite 112, Elmhurst, Ill. 60126.

National Automobile Dealers Association, 8400 Westpark Dr., McLean, Va. 22102

Information on how to become a certified automobile mechanic is available from:

National Institute for Automotive Service Excellence, 1825 K St. NW., Washington, D.C. 20006.

# Farm Equipment Mechanics

(D.O.T. 624.281, .361-014, .381, and .684)

## Nature of the Work

Many years ago farmers planted, cultivated, and harvested their crops using only handtools and simple, animal-drawn equipment. Few repairs were required, and if a stray rock or stump broke a plow blade, the metal pieces could be joined together by the local blacksmith. Even when tractors began to replace animals as the prime source of power, the early models were not very complicated and most farmers did their own repair work.

But in the last quarter century, farm equipment has grown enormously in size, complexity, and variety. Many farms have both diesel and gasoline tractors, some equipped with 300-horsepower engines. Harvesting combines, hay balers, corn pickers, crop dryers, and elevators also are common. In today's world of large-scale, mechanized agriculture, few if any types of farming can be done economically without specialized machines.

As farm machinery grew more complex, it became important for the sellers of farm equipment to be able to service and repair the machines they sold. Almost every dealer employs farm equipment mechanics to do this work and to maintain and repair the smaller lawn and garden tractors dealers sell to suburban homeowners.

In addition, some mechanics who work for dealers and equipment wholesalers assemble new implements and machinery and sometimes do body work, repairing dented or torn sheet metal on the tractors or other machinery.

Mechanics spend much of their time repairing and adjusting malfunctioning equipment that has been brought to the shop. But during planting and harvesting, they may travel to the farm to make emergency repairs on equipment so that critical farming operations are not unduly delayed.

Mechanics also perform preventive maintenance. Periodically, they test, adjust, and clean parts and tune engines. In large shops, mechanics may specialize in certain types of work, such as gasoline or diesel engine overhaul or clutch and transmission repair. Others specialize in repairing the air-conditioning units often included in the cabs of combines and large tractors, or in repairing certain types of equipment such as hay balers. Some mechanics also repair plumbing, electrical, irrigation, and other equipment on farms.

Mechanics use many basic handtools including wrenches, pliers, hammers, and screwdrivers. They also may use precision equipment such as micrometers and torque wrenches and complex testing equipment, such as dynamometers to measure engine

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performance, or compression testers to find worn piston rings or leaking cylinder valves. They may use welding equipment or power tools to repair broken parts.

## Working Conditions

Generally, farm equipment mechanics work indoors. Modern farm equipment repair shops are well ventilated, lighted, and heated, but older shops may not offer these advantages. During planting and harvesting seasons, mechanics often make emergency repairs in the field. To do so, mechanics may have to travel many miles and work in all types of weather. Farm equipment mechanics come in contact with grease, gasoline, rust, and dirt, and there is danger of injury when they repair heavy parts supported on jacks or by hoists. Care must also be used to avoid engine burns and cuts from sharp edges of machinery.

## Employment

Most of the nearly 25,000 farm equipment mechanics employed in 1980 worked in service departments of farm equipment dealers. Others worked in independent repair shops, in shops on large farms, and in service departments of farm equipment wholesalers and manufacturers. Most farm equipment repair shops employ fewer than five mechanics, although a growing number of dealerships employ more than ten. A small proportion of farm equipment mechanics are self-employed.

Because some type of farming is done in nearly every area of the United States, farm equipment mechanics are employed throughout the country. Employment is concentrated in small cities and towns, making this an attractive career choice for people who do not wish to live the fast-paced life of an urban environment. However, many mechanics work in the rural fringes of metropolitan areas, so farm equipment mechanics who prefer the conveniences of city life need not live in rural areas.

## Training, Other Qualifications, and Advancement

Employers prefer applicants who have an aptitude for mechanical work. A farm background is an advantage since growing up on a farm usually provides experience in basic farm equipment repairs. Employers also prefer high school graduates, but some will hire applicants who have less education. In general, employers stress previous experience or training in diesel and gasoline engines, the maintenance and repair of hydraulics, and welding—subjects that may be learned in many high schools and vocational schools. Some employers also may require mechanics to be able to read circuit diagrams and blueprints in order to make complex repairs to electrical and other systems.

Most farm equipment mechanics are hired as trainees and learn the trade on the job by assisting qualified mechanics. The length of training varies with the helper's aptitude and prior experience. At least 2 years of on-the-job training usually are necessary before a mechanic can do most types of repair work, and additional training and experience are required for highly specialized repair and overhaul jobs.

Many farm equipment mechanics enter this occupation from a related occupation. For instance, they may gain experience as farmers and farm laborers, or as heavy equipment mechanics, auto mechanics, or air-conditioning mechanics. People who enter from related occupations also may start as helpers, but they may not require a long period of on-the-job training.

With the development of more complex farm implements, technical training has become more important. A growing number of large employers prefer applicants who have completed 1 or 2 years of vocational training in agricultural mechanics, including electronics.

A few farm equipment mechanics learn the trade by completing an apprenticeship program, which lasts from 3 to 4 years and includes on-the-job as well as classroom training in all phases of farm equipment repair and maintenance. Applicants for these programs usually are chosen from shop helpers.

Some farm equipment mechanics and trainees receive refresher training in short-term programs conducted by farm equipment manufacturers. These programs usually last several days. A company service representative explains the design and function of equipment and teaches maintenance and repair on new models of farm equipment. In addition, some dealers may send employees to local vocational schools that teach special weeklong classes in subjects such as air-conditioning repair or hydraulics.

Persons considering a career in this field should have the manual dexterity needed to handle tools and equipment. Occasionally, strength is required to lift, move, or hold in place heavy parts. Difficult repair jobs may require problem-solving abilities, so experienced mechanics should be able to work independently with minimum supervision.

Farm equipment mechanics may advance to shop supervisor or manager of a farm equipment dealership. Some mechanics open their own repair shops. A few farm equipment mechanics earn 2-year associate degrees in agricultural mechanics and advance to service representatives for farm equipment manufacturers.

## Job Outlook

Employment of farm equipment mechanics is expected to increase about as fast as the average for all occupations through the 1980's. In addition to jobs created from increased demand, many openings will arise each year as experienced mechanics transfer to other occupations, retire, or die. Opportunities will be best for applicants who have lived or worked on farms and know how to operate farm machinery and make minor repairs.

The development of more technically advanced farm equipment, requiring greater maintenance, will increase the demand for mechanics. For instance, many newer tractors have much larger engines, and feature advanced transmissions with as many as 24 speeds. More complex electrical systems also are used to operate the great variety of gauges and warning devices now used to alert the operator to problems such as brake wear, low oil pressure in the transmission, or insufficient coolant in the radiator. Advances such as these and air-conditioned cabs, which

During planting and harvesting seasons, equipment is repaired while still in the field.

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have improved the comfort of the operator, have made it more difficult for farmers to do their own repairs. Thus farmers will have to rely more on skilled mechanics in the future.

In addition to the development of larger and more complex farm machinery, sales of smaller lawn and garden equipment have increased vastly over the past decade and are expected to continue to do so. Most of the large manufacturers of farm equipment now offer a line of these smaller tractors and sell them through their established dealerships. More mechanics will be needed to service this equipment.

As with most agricultural occupations, the demand for farm equipment mechanics is highest during planting and harvesting seasons. During these busy periods, mechanics often work 6 or 7 days a week, 10 to 12 hours daily. In winter months however, mechanics may work less than 40 hours a week and some may be laid off.

## Earnings

Farm equipment mechanics employed by dealerships had average hourly wages ranging from about $6 to over $11 in 1980, according to the limited information available. The highest salaries were paid to workers with the most experience and to those performing the most complicated repairs. In addition, higher salaries were paid in the heavily agricultural regions where competition is greatest for the more highly skilled mechanics. Most farm equipment mechanics also have the opportunity to work overtime during the planting and harvesting seasons, for which they are paid time and one-half.

Very few farm equipment mechanics belong to labor unions, but those who do are members of the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace, and Agricultural Implement Workers of America; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.).

## Related Occupations

Other craft workers who work on large machinery and whose jobs often are in small towns and other nonmetropolitan areas include automobile mechanics, diesel mechanics, truck mechanics, and construction equipment mechanics.

## Sources of Additional Information

Details about work opportunities may be obtained from local farm equipment dealers and local offices of the State employment service. For general information about the occupation, write to:

National Farm and Power Equipment Dealers Association, 10877 Watson Road, St. Louis, Mo. 63127.

# Truck Mechanics and Bus Mechanics

(D.O.T. 619.380-018; 620.261-010 and -012; .281-010, -026, -030, -034, 038, -046, 062, -066, and -070; .364-010; .381-010, -018, and -022; .584-010; .664-014; .682-010; .684-014, -018, and -022; 625.261-010; .281-010, -014, and -022; .361-010; .684-010; 706.381-046; 721.281-010 and -026; 806.684-118; 807.381-022; and 825.281-022)

## Nature of the Work

Commercial vehicles serve an important function in the Nation's economy. Heavy trucks are used by industries such as mining and construction to carry ore and building materials, and by commercial trucking lines for general freight hauling. Small trucks are used for local hauling. Buses are used for both local and transcontinental transportation, as well as for shipping some goods. Truck and bus mechanics keep these vehicles in good operating condition.

Truck and bus mechanics work on both diesel and gasoline engines. Diesel engines are found mostly in heavy trucks and buses, although growing numbers of lighter trucks, buses, and even cars are being built with diesels because of their durability and greater fuel efficiency.

Mechanics who work for organizations that maintain their own vehicles may spend much time doing preventive maintenance to assure safe operation, prevent wear and damage to parts, and reduce costly breakdowns. During a maintenance check, they usually follow a regular check list that includes the inspection of brake systems, steering mechanisms, wheel bearings, and other important parts. They usually can repair or adjust a part that is not working properly. Parts that cannot be fixed are replaced.

In many shops mechanics do all kinds of repair work. For example, they may work on a vehicle's electrical system one day and do major engine repair the next. In some large shops, however, mechanics specialize in one or two types of work. For example, one mechanic may specialize in major engine repair, another in transmission work, another in electrical systems, and yet another in suspension or brake systems.

Truck and bus mechanics use a variety of tools in their work. They use power tools such as pneumatic wrenches to remove bolts quickly; machine tools such as lathes and grinding machines to rebuild brakes and other parts; welding and flame-cutting equipment to remove and repair exhaust systems and other parts; common handtools such as screwdrivers, pliers, and wrenches to work on small parts and get at hard-to-reach places; and jacks and hoists to lift and move large parts. Truck and bus mechanics also use a variety of testing equipment. For example, when working on electrical systems, they may use ohmmeters, ammeters, and voltmeters; to locate engine malfunctions, they often use tachometers and dynamometers.

For heavy work, such as removing engines and transmissions, two mechanics may work as a team, or a mechanic may be assisted by an apprentice or helper. Mechanics generally get their assignments from shop supervisors or service managers who may check the mechanics' work or assist in diagnosing problems.

## Working Conditions

Truck and bus mechanics usually work indoors, although they may occasionally work or make repairs on the road. They are subject to the usual shop hazards such as cuts and bruises. Mechanics handle greasy and dirty parts and may stand or lie in awkward or cramped positions to repair vehicles. Work areas usually are well lighted, heated, and ventilated, and many employers provide locker rooms and shower facilities.

## Employment

An estimated 175,000 truck and bus mechanics were employed in 1980. Most truck mechanics worked for firms that owned fleets of trucks, including trucking companies and businesses that haul their own products, such as dairies and bakeries. Others worked for truck dealers, truck manufacturers, truck repair shops, firms that rent or lease trucks, and Federal, State, and local governments.

Most bus mechanics worked for local transit companies and intercity buslines. Others maintained school buses for public and private schools and companies that operate school buses under contract. Some also worked for bus manufacturers.

Truck and bus mechanics are employed in every section of the country, but most work in large towns and cities where trucking companies, buslines, and other fleet owners have large repair shops.

## Training, Other Qualifications, and Advancement

Most truck or bus mechanics learn their skills on the job. Beginners usually do tasks such as cleaning parts, fueling, lubricating, and driving vehicles in and out of the shop. As beginners gain experience and as vacancies become available, they usually are promoted to mechanics' helpers. In some shops, beginners—especially those having automobile repair experience—start as mechanics' helpers.

Most helpers can make minor repairs after a few months' experience and advance to increasingly difficult jobs as they prove their ability. Generally, at least 3 to 4 years of on-the-job experience are necessary to qualify as an all-round truck or bus mechanic. Additional training may be necessary for mechanics who wish to specialize in diesel engines.

Most training authorities recommend a formal 4-year apprenticeship as the best way to learn these trades. Typical apprenticeship programs for truck and bus mechanics consist of approximately 8,000 hours of practical

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experience working on transmissions, engines, and other components and at least 576 hours of formal instruction to learn blueprint reading, mathematics, engine theory, and safety. Frequently, these programs include training in both diesel and gasoline engine repair.

For entry jobs, employers generally look for applicants who have mechanical aptitude and are at least 18 years of age and in good physical condition. Completion of high school also is an advantage in getting an entry job. A State chauffeur's license is needed for test driving trucks or buses on public roads.

High school, vocational school, or private trade school courses in automobile and diesel repair are valuable. Science and mathematics help a mechanic understand how trucks and buses operate. Practical experience in automobile repair in a gasoline service station or the Armed Forces or from a hobby also is valuable.

Most mechanics must buy their own handtools. Experienced mechanics often have hundreds of dollars invested in tools.

Bus mechanic inspects the brake system during a maintenance check.

Employers sometimes send experienced mechanics to special training classes conducted by truck, bus, diesel engine, and parts manufacturers. Here mechanics learn to repair the latest equipment or receive special training in subjects such as diagnosing engine malfunctions. Mechanics also must read service and repair manuals to keep abreast of engineering changes.

Voluntary certification by the National Institute for Automotive Service Excellence is recognized as a standard of achievement for truck mechanics. Mechanics may be certified as general heavy duty truck mechanics or may be certified in one or more of six different areas of heavy duty truck repair: Brakes, gasoline engines, diesel engines, drive train, electrical systems, and suspension and steering. A general heavy duty truck mechanic must meet the requirements for certification in either gasoline or diesel engines and the other four areas. For certification in each area, mechanics must pass a written examination and have at least 2 years of experience. High school, vocational or trade school, or community or junior college training in gasoline or diesel engine repair may substitute for up to 1 year of experience. Certified mechanics must retake the tests at least every 5 years.

Experienced mechanics who have leadership ability may advance to shop supervisors or service managers. Truck mechanics who have sales ability sometimes become truck sales representatives. Some mechanics open their own gasoline service stations or repair shops.

## Job Outlook

Employment of truck mechanics is expected to increase about as fast as the average for all occupations through the 1980's as freight transportation by truck increases. More trucks will be needed for both local and intercity hauling due to the increased production of goods. In addition, many openings will arise to replace truck mechanics who transfer to other occupations, retire, or die.

Bus mechanic employment is expected to increase about as fast as the average for all occupations through the 1980's as the number of buses on the Nation's roads increases. More buses will be needed for local travel due to improved mass transit systems. Intercity bus travel, on the other hand, is expected to increase slowly. Most job openings will result from the need to replace bus mechanics who transfer to other occupations, retire, or die.

## Earnings

Truck and bus mechanics employed by trucking companies, buslines, and other firms that maintain their own vehicles had estimated average hourly earnings of $9.72 in 1980, about one and one-half times the average earnings of all nonsupervisory workers in private industry, except farming.

Beginning apprentices usually earn one-half the rate of skilled workers and receive increases about every 6 months until they complete their apprenticeship and reach the rate of skilled mechanics.

Most mechanics work between 40 and 48 hours per week. Those employed by truck and bus firms which provide service around the clock may work evenings, nights, and weekends. They usually receive a higher rate of pay for this work.

Many truck and bus mechanics are members of labor unions, including the International Association of Machinists and Aerospace Workers; the Amalgamated Transit Union; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Transport Workers Union of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffers, Warehousemen and Helpers of America (Ind.).

## Related Occupations

Truck and bus mechanics repair trucks and buses and keep them in good working order. Related motor vehicle service occupations include automobile body repairers, customizers, mechanics, painters, and repair service estimators.

## Sources of Additional Informaiton

More details about work opportunities for truck or bus mechanics may be obtained from local employers such as trucking companies, truck dealers, or bus lines; locals of unions previously mentioned; or the local office of the State employment service. Local State employment service offices also may have information about apprenticeships and other training programs.

For general information about the work of truck mechanics and apprenticeship training, write to:

American Trucking Associations, Inc., 1616 P St. NW., Washington, D.C. 20036.

Automotive Service Industry Association, 444 North Michigan Ave., Chicago, Ill. 60611.

International Association of Machinists and Aerospace Workers, Apprenticeship Department, 1300 Connecticut Ave. NW., Washington, D.C. 20036.

Information on how to become a certified heavy duty truck mechanic is available from :

National Institute for Automative Service Excellence, 1825 K St. NW., Washington, D.C. 20006.

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# Electrical and Electronic Equipment Repairers

The sophisticated technology that marks our society revolves largely around electrical and electronic equipment. Electrical and electronic equipment repairers install, maintain, and repair this equipment. Many of them deal with the highly complex communications and data transmission equipment that, within a very short time, has brought computers into everyday use in factories, hospitals, schools, stores, ticket offices, and many other places.

Mechanical aptitude and a knowledge of electrical theory are essential in these occupations. For many of them, some knowledge of advanced electronic theory and skill in the use of electronic testing equipment are also necessary.

At the entry level, repairers may need only a high school diploma. They acquire specific job skills through on-the-job training, a formal apprenticeship, or an employer's training program. For many of these jobs, however, employers require formal training in electronics, which may be obtained in Armed Forces schools, vocational-technical institutes, community colleges, or private trade schools. Continuing education is important in this rapidly changing field, and many electronic equipment repairers periodically attend company-sponsored training sessions to learn about new technological advances and to sharpen their repair skills.

This section of the *Handbook* describes nine repair occupations: Appliance repairers, central office craft occupations, central office equipment installers, computer service technicians, electric sign repairers, line installers and cable splicers, maintenance electricians, telephone and PBX installers and repairers, and television and radio service technicians.

## Appliance Repairers

(D.O.T. 637.261-018, 723.381, .584-010, 827.261, .464-010, .584-010, and .661-010)

### Nature of the Work

Most household chores such as cooking and cleaning used to be performed by hand and often involved a great deal of time and physical effort. Today, a variety of laborsaving appliances make many household jobs much simpler to do. Microwave ovens cook meals in minutes. Washers and dryers clean clothes with little physical effort. Indeed, the number of household jobs machines can do is almost limitless. Even simple tasks such as cooking a hamburger or opening a can are done with appliances made specifically for those purposes. Servicing these machines is the job of the appliance repairer.

Appliance repairers usually specialize in servicing either portable appliances such as toasters and vacuum cleaners or major appliances such as refrigerators, freezers, washers, and dryers. Repairers in large shops generally are more specialized than those in small shops.

Portable appliances are worked on in shops. Major appliances usually are repaired in customers' homes by appliance repairers who carry their tools and a number of commonly used parts with them in a truck.

To determine why an appliance is not working properly, repairers operate it to detect unusual noises, overheating, or excess vibration. They look for common sources of trouble, such as faulty electrical connections, and consult service manuals and troubleshooting guides. They may disassemble the appliance to examine its parts. To check electric systems, repairers follow wiring diagrams and use testing devices, such as ammeters, voltmeters, and wattmeters.

After locating the trouble, the repairer makes the necessary repairs or replacements according to the type of appliance and defect involved. To fix a portable appliance such as a toaster, the repairer may replace a defective heating element. To fix a major appliance such as a washer, the repairer may replace worn bearings, transmission belts, or gears. To remove old parts and install new ones, repairers use common handtools, including screwdrivers, soldering irons, files, pliers, and special tools designed for particular appliances. Repairers operate the appliance after completing a repair to check their work.

Repairers may answer customers' questions and complaints about appliances and frequently advise customers about the care and use of the appliance. For example, they may show the owners how to load automatic washing machines or arrange dishes in dishwashers.

Appliance repairers may estimate and collect the cost of repairs. They also keep records of parts used and hours worked on each job.

### Working Conditions

Repair shops generally are quiet, well lighted, and adequately ventilated. Working conditions outside the shop vary. For example, repairers sometimes work in narrow spaces and uncomfortable positions amidst dirt and dust. Those who repair appliances in homes may spend several hours a day driving.

Although the work generally is safe, repairers could have an accident while handling electrical parts and lifting and moving large appliances. Inexperienced workers are shown how to use tools safely and how to avoid electric shock.

Appliance repairers usually work with little or no direct supervision. This feature of the job appeals to many people.

### Employment

About 77,000 people were employed as appliance repairers in 1980, many in independent appliance stores and repair shops. Others worked for service centers operated by appliance manufacturers, department stores, wholesalers, and gas and electric utility companies.

Appliance repairers are employed in almost every community, but are concentrated in the more highly populated areas.

### Training, Other Qualifications, and Advancement

Appliance repairers learn their trade on the job. Many repairers have completed formal training in appliance repair and related subjects in high schools, private vocational schools, and community colleges. The programs in these schools provide the background in electrical and mechanical repair that is needed to enter this occupation. However, graduates usually need additional training from their employer.

The type of training provided by employers varies among companies. In shops that fix portable appliances, new employees work on a single type of appliance, such as vacuum cleaners, until they master its repair. Trainees then move on to work on a different type of appliance; this process continues until they can repair a variety of appliances. In companies that repair major appliances, beginners may be trained by experienced repairers during house calls. In other cases, they are taught while working in the shop rebuilding used parts such as washing machine transmissions. Up to 3 years of on-the-job training may be needed to become skilled in all aspects of repairing some of the more complex appliances.

Some large companies such as appliance manufacturers and department store chains have formal training programs, which include home study courses and shop classes, where trainees work with demonstration appliances and other training equipment.

Many repairers receive supplemental instruction through seminars that are conducted periodically by appliance manufacturers. These seminars usually last 1 or 2 weeks and deal with the repair of one of the manufacturer's appliances. To become familiar with new appliances and the proper ways to repair them, experienced repairers attend training classes or study service manuals.

Persons who want to become appliance repairers generally must have a high school diploma. Courses in electronics are essential

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Appliance repairers often work in customers' homes.

because most repairs involve work with electrical equipment. Mechanical aptitude is also desirable. Appliance repairers who work in customers' homes must be courteous and tactful.

Appliance repairers in large shops or service centers may be promoted to supervisor, assistant service manager, or service manager. A few may advance to managerial positions such as regional service manager or parts manager for appliance manufacturers. Preference is given to those who show ability to get along with coworkers and customers. Experienced repairers who have sufficient funds may open their own appliance stores or repair shops.

## Job Outlook

Employment of appliance repairers is expected to grow about as fast as the average for all occupations through the 1980's. In addition to the jobs created by increased demand for appliance repairers, many openings will arise each year from the need to replace experienced repairers who transfer to other occupations, retire, or die.

The number of appliances in use is expected to increase very rapidly as the number of households grows and new and improved appliances are introduced. While modern appliances generally require less service than older models, maintaining the large number of appliances will generate demand for qualified repairers. Because electronic parts are increasingly used in modern appliances, repairers with a strong background in electronics should have the best job prospects.

People who enter the occupation should have steady work because the demand for appliance repair services continues during economic downturns.

## Earnings

Hourly earnings of experienced appliance repairers ranged from about $10 to $12 in 1980, based on the limited data available. The starting rate for inexperienced trainees was about $5 an hour. The variations in wages reflect differences in repairers' skill and experience, geographic location, and the type of equipment serviced.

Some appliance repairers belong to the International Brotherhood of Electrical Workers.

## Related Occupations

Other workers who service electrical and electronic equipment include air-conditioning mechanics, bowling-pin-machine mechanics, business machine repairers, electric sign repairers, electronic organ technicians, television and radio repairers, and vending machine mechanics.

## Sources of Additional Information

For further information about jobs in the appliance service field, contact local appliance repair shops, appliance dealers and utility companies, or the local office of the State employment service.

Information about training programs or work opportunities also is available from:

Association of Home Appliance Manufacturers, 20 N. Wacker Dr., Chicago, Ill. 60606.

# Central Office Craft Occupations

(D.O.T. 722.281-010, 822.261-010, .281-014 and -034, .361-026 and -030, and .684-010)

## Nature of the Work

Central office craft workers maintain and repair the complex equipment in telephone companies' central offices. Most specialize in one of three areas: Frame wiring, central office repair, or trouble locating. In small telephone companies, central office craft workers must perform all of these jobs.

*Frame wirers*, sometimes referred to as frame workers, connect and disconnect wires that run from telephone lines and cables to equipment in central offices. This equipment consists of a frame having many terminal lugs mounted on it, each of which is assigned a specific telephone number. It also contains one pair of wires for each telephone that is connected to that central office. To connect a new telephone, the frame wirer solders the customer's pair of wires to a set of terminal lugs. To disconnect a telephone, a frame wirer melts the solder and removes the wires from the terminal. Frame wirers occasionally change a customer's phone number by reconnecting the customer's pair of wires to a different set of terminal lugs. To gain experience, frame wirers generally work on residential telephone service. Later, they may work on more complex special services, such as circuitry for large business systems, civil defense warning sirens, or burglar alarms.

*Central office repairers* maintain the switching equipment that automatically connects lines when customers dial numbers. Electromechanical switching systems contain moving parts that must be cleaned and oiled periodically. Also, electronic switching circuits must be checked occasionally for breakages.

When customers report trouble with their telephones, *trouble locators* work at special switchboards—sometimes called testboards—to find the source of the problem. To do this, they communicate with telephone installers and repairers as they attempt to connect a portable telephone through the customer's service line to the central office. The trouble shooter locates the problem by having the telephone repairer connect the portable phone at various places on the customer's line until a connection can be made to the central office. For a problem at the central office, the trouble locator repeats this procedure with a central office repairer. In addition, trouble locators test new equipment to make sure installations are made correctly. They also work with other employees, such as central office repairers and cable splicers, who help find the cause of trouble and make repairs.

In addition to these three principal occupations, there are several smaller craft jobs in central offices. *Instrument repairers*, sometimes referred to as shop repairers, use handtools and power tools to repair, test, and modify telephone equipment, such as telephones, teletypewriters, and switchboards. *Transmission testers* test and operate telephone equipment in central offices that service lines between communities. *Office electricians* make operating adjustments in submarine cable repeater and terminal circuits and apparatus, as well as rearrange cable connections to maintain the continuity of

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As part of their normal routine, central office repairers check the switching equipment.

service. Using electrical meters and handtools, *submarine cable equipment technicians* repair, adjust, and maintain the machines and equipment used in submarine-cable offices or stations to control cable traffic.

## Working Conditions

Because the telephone industry gives continuous service to its customers, central offices operate 24 hours a day, 7 days a week. Many central office craft workers, therefore, have work schedules that include shifts, weekends, and holidays. Where shift work is required, the assignments are made on the basis of seniority. To cope with any emergency that may arise, central office craft workers, like other telephone company employees, are subject to 24-hour call—that is, subject to being called to work at a moment's notice. Central office craft workers generally work in clean, well-lighted, air-conditioned surroundings. Depending on the job, they may have to stand for long periods, climb ladders, and do some reaching, stooping, and light lifting. Because older central office equipment continually produces sounds, these workers must learn to "block out" noise.

## Employment

Telephone companies employed almost 85,000 central office craft workers in 1980. Only a small percentage worked part time.

## Training, Other Qualifications, and Advancement

Preference in filling central office craft jobs generally is given to employees already with the telephone company, such as operators, clerical workers, or line installers. Occasionally, trainees are hired from outside the company.

Because telephone wires are usually color coded, persons who are considering careers in central office crafts should not be color blind. Physical strength and agility are needed for carrying equipment and climbing and working from ladders, and physical examinations generally are required. In addition to manual dexterity (to work with small tools), applicants should have the analytical skills and judgment to resolve mechanical difficulties. Self-discipline is needed to follow detailed instructions without close supervision. Prospective central office craft workers should be able to work as part of a team, since cooperation with others often is essential in solving complex problems. A basic knowledge of electricity and electronics and telephone training in the Armed Forces are helpful. Experience in data systems technology or computer maintenance is valuable for work with electronic switching systems.

Telephone companies give classroom instruction and on-the-job training to new central office craft employees. In addition, telecommunications equipment manufacturers often train central office craft workers to use, maintain, and repair equipment that they sell to telephone companies. Some vocational schools, particularly in rural areas served by small, independent telephone companies, train persons interested in becoming central office craft workers. Sometimes classrooms are supplied with equipment similar to that which the trainee will be using on the job.

Trainees for central office craft jobs generally begin as frame wirers. This is an entry job, and there are no set educational requirements. Although local hiring practices vary, many companies do not require a high school diploma. The ability to read and understand company manuals and work orders is important, however. New workers receive classroom instruction and on-the-job training that lasts about 6 months. They gain practical experience by observing and helping experienced frame wirers under the direction of supervisors. After 1 or 2 years of satisfactory performance, frame wirers may be selected to train for a more skilled telephone craft, such as central office repairer or telephone installer-repairer.

Certain central office repair jobs sometimes are filled by inexperienced entry workers, but previous electrical or electronic experience is preferred. Often, trainees come from the ranks of the company's frame wirers, telephone installer-repairers, or line installer-repairers. Depending upon the complexity of the equipment to be maintained, companies provide up to 7 months of classroom instruction, followed by a lengthy period of on-the-job training. Workers return to the classroom from time to time to learn repair of new types of equipment, which may include electronic switching systems, data transmission equipment, and picturephones. These workers have a number of opportunities for advancement, some of which involve further technical training. They may be promoted to jobs as trouble locators, engineering assistants, microwave maintainers, picture-telephone repairers, data instrument repairers, or supervisors. (Work involving radio or microwave transmission requires a second-class radiotelephone license.) Other possibilities are promotion into sales or personnel work.

Trouble locator is not an entry job, but is open to persons already employed in the telephone company. Related experience or training is required and may be obtained as a central office repairer or as a telephone installer-repairer. A broad knowledge of the various telephone crafts provides the best background for the work. An experienced worker may be promoted to supervisor, and besides coordinating the activities of a group of trouble locators, keep supervisors of cable and other crews informed of repairs that need to be made. Promotion also is possible to engineering assistant or to sales or personnel work.

Telephone companies give central office craft employees continued training through-

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out their careers to keep them abreast of the latest developments. As new types of equipment and tools and new maintenance methods are introduced, employees are sent to schools to learn about them. When travel is required for training purposes, the company pays the expenses. Colleges, universities, private firms, and State telephone associations also offer short training courses.

## Job Outlook

Employment of central office craft workers will be subject to conflicting trends during the 1980's. As the population grows, becomes more mobile, and is offered a wider array of telecommunications services, demand should rise for the installation of switching and transmission equipment in central offices. However, electromechanical switching systems are being replaced with electronic switching systems that require considerably fewer installers, due to smaller size and increased prefabrication. Moreover, the new, electronically equipped central offices use sophisticated, self-diagnosing test equipment that requires fewer repair and maintenance personnel.

Overall, employment of central office craft workers over the next decade is expected to show little change and may decline. Any decreased labor requirements in the central office crafts are not likely to result in layoffs, however. Labor-management cooperation in minimizing the adverse effects of technological change is well established in the telephone industry. The planned use of attrition is a major technique for reducing employment. In addition, unneeded workers are being retrained and transferred to other jobs or localities.

Although the number of central office craft workers might drop through the 1980's, some job openings will arise every year as experienced workers transfer to other occupations, retire, or die. As noted above, openings for central office craft workers generally are filled by the advancement of other workers already employed by telephone companies.

## Earnings

Wage rates for central office craft workers vary greatly across the country; local companies can supply specific information. Earnings increase considerably with length of service; it normally takes 4 or 5 years to reach the top of the pay scale. In 1980, the average hourly wage for frame wirers was $8.80; for central office repairers, $10.65; and for trouble locators, $10.74. Nonsupervisory workers in all private industries, except farming, averaged $6.66 an hour in 1980.

Most central office craft workers are members of the Communications Workers of America, the International Brotherhood of Electrical Workers, or the Telecommunications International Union. For these workers, union contracts determine wage rates, wage increases, and the time needed to advance from one step to the next. Contracts also require extra pay for work beyond the normal 8 hours a day or 5 days a week, and for all work on Sundays and holidays. Additional pay for nightwork is provided for in most contracts. Paid vacations are granted based on time in service. Generally, contracts provide for a 1-week vacation beginning with 6 months of service; 2-weeks for 1 to 6 years; 3-weeks for 7 to 14 years; 4-weeks for 15 to 24 years; and 5-weeks for 25 years and over. Depending on locality, holidays range from 9 to 11 days a year. Other contract provisions include the following: Paid sick leave; group life, medical, and dental insurance; sickness and accident benefits; retirement and disability pensions; a savings plan; and an employee stock ownership plan.

## Related Occupations

Other workers who have the skills needed to do technical, manual work with tools and machines include automobile mechanics, biomedical equipment technicians, carpenters, cement masons, electricians, machinists, plumbers, sound technicians, toolmakers, and welders.

## Sources of Additional Information

For more details about employment opportunities, contact your local telephone company or unions that represent telephone workers. For general information on central office craft jobs, write to:

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

Telecommunications International Union, P.O. Box 5462, Hamden, Conn. 06518.

For general information on the independent (non-Bell) telephone industry and career opportunities, request copies of "Independent Phonefacts" and "Is It for You? A Career in the Independent Telephone Industry" from:

United States Independent Telephone Association, 1801 K St. NW., Suite 1201, Washington, D.C. 20006.

# Central Office Equipment Installers

(D.O.T. 822.361-014)

## Nature of the Work

Central office equipment installers set up the complex switching and dialing equipment used in central offices of telephone companies. They install equipment in new central offices, add equipment in an expanding office, or replace outdated equipment.

Installers follow blueprints, diagrams, and floor plans to position and wire equipment. They often use hoists to lift heavy items and handtools, such as screwdrivers or soldering guns, to connect equipment once it is in place. Recently developed electronic equipment sometimes comes in preassembled components and often requires only simple plug-in connections.

After the new equipment has been put in place, installers connect the outgoing and incoming telephone trunklines, consulting diagrams to ensure that connections are made correctly. Once this is completed, installers then test the system, using communication testing equipment, such as pulsing test sets, oscilloscopes, and voltmeters, to measure the strength and consistency of the current flow. If the system is not functioning properly, installers must determine the cause of the difficulty and correct the malfunction.

## Working Conditions

Central office equipment installers often work in buildings under construction. They have to lift and carry heavy tools, climb ladders, and do a lot of stooping, crouching, and reaching. They face certain hazards, such as falls from ladders, injuries from falling objects, and cuts and burns from tools.

## Employment

An estimated 25,000 installers were employed in 1980. Most worked for manufacturers of central office equipment. Others worked directly for telephone companies or for private contractors who specialize in large-scale installations.

Most central office equipment installers work in metropolitan areas, where large central offices are found. Hundreds of installers may be required to work on large jobs such as a long-distance toll center in a big city. Other installers are assigned areas that include several States, and, therefore, must travel frequently to small towns within their area. Installing equipment in small communities often requires only two or three installers.

## Training, Other Qualifications, and Advancement

Individuals considering careers as central office equipment installers should have manual dexterity, good eyesight, and, because telephone wires are generally color coded, should not be color-blind. They should be able to work with others, for teamwork often is essential to solve a complex problem. Although manufacturers generally provide all the necessary training for this job, formal training and experience in mechanical, electrical, and electronic areas are helpful. Familiarity with computer operations and repair also is advantageous.

New employees attend classes the first few weeks to learn basic installation and then begin on-the-job training. Often trainees will be transported to the plant where the equipment is manufactured to receive training.

Experienced workers may qualify as skilled installers. Additional courses are given from time to time to improve skills, to teach new installation techniques, and to keep up with technological changes in equipment. Installers must be trained to install new equipment.

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Installers who have managerial ability can advance to supervisory positions.

## Job Outlook

Employment of central office equipment installers is expected to decline through the 1980's. However, some openings will arise each year to replace experienced installers who transfer to other work, retire, or die.

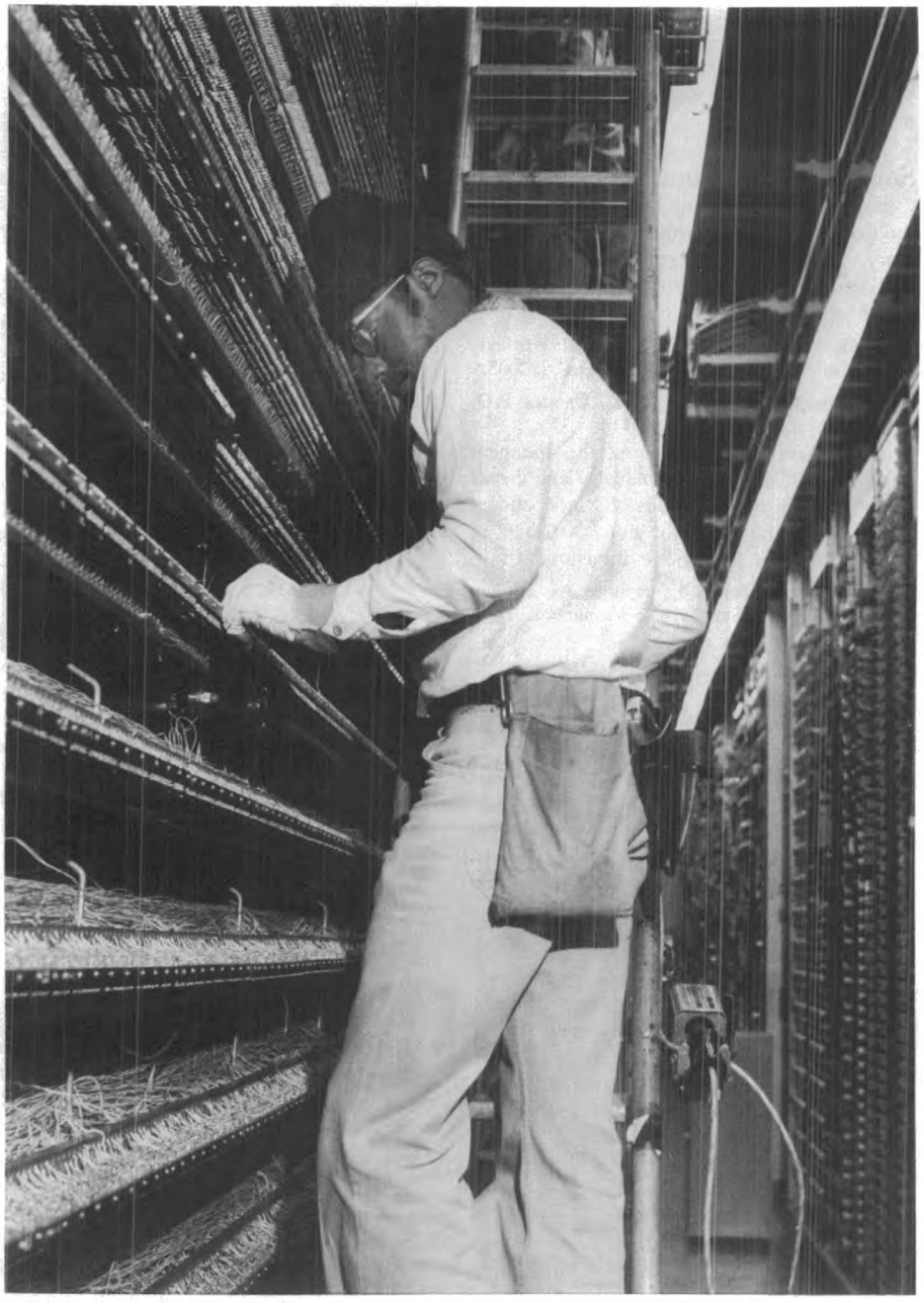
The introduction of remote switching systems and the consolidation of smaller electromechanical offices into larger electronic ones are expected to slow the rate of construction of new central offices during the next decade. Although obsolete manual and dial switching equipment will be replaced with more efficient electronic analog and digital switching systems, this new equipment is manufactured in components and modules that greatly reduce the time needed for testing and installation. This greater efficiency should offset the demand from new construction and conversion of existing equipment and reduce employment through the 1980's.

Employment may fluctuate from year to year because investment in central office equipment is subject to changes in business conditions and availability of funds. Thus, when the economy is prospering, installations and modernization of central offices may occur at an above-average pace. Conversely, when the economy slows down, this activity may be reduced.

## Earnings

The earnings of central office equipment installers vary by employer, geographic location, and experience. Pay rates for most installers in 1980 ranged from a starting rate of $5.15 per hour to a top rate of $12.37. Union contracts covering installers provided for periodic wage increases, with 5 years generally needed to reach the highest level. Travel and expense allowances also were provided. The average earnings of experienced central office equipment installers are above the average for all nonsupervisory workers in private industry, except farming.

The Communications Workers of America union represents most central office equipment installers, including all those with the Bell System. The International Brotherhood of Electrical Workers represents some installers employed by various telephone companies, by manufacturers supplying the independent segment of the telephone industry, and by large installation contractors. For these workers, union contracts determine wage rates, wage increases, and the time needed to advance from one step to the next. Contracts also require extra pay for work beyond the normal 8 hours a day or 5 days a week, and for all work on Sundays and holidays. Additional pay for nightwork is provided for in most contracts. Paid vacations are granted based on time in service. Generally, contracts provide for a 1-week vacation beginning with 6 months of service; 2 weeks for 1 to 6 years; 3 weeks for 7 to 14 years; 4 weeks for 15 to 24 years; and 5 weeks for 25 years and over. Depending on locality, holidays range from 9 to 11 days a year. Other contract provisions including the following: Paid sick leave; group life, medical, and dental insurance; sickness and accident benefits; retirement and disability pensions; a savings plan; and an employee stock ownership plan.



The work of central office equipment installers requires close attention to detail.

## Related Occupations

Workers in other occupations for which training is needed to do technical, manual work with tools and machines include automobile mechanics, biomedical equipment technicians, carpenters, cement masons, electricians, machinists, plumbers, sound technicians, toolmakers, and welders.

## Sources of Additional Information

For more details about employment opportunities, contact your local telephone company or unions that represent telephone workers. For general information, write to:

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# Computer Service Technicians

(D.O.T. 828.261-014 and .281-010)

## Nature of the Work

Computer systems play a vital role in our lives. They help us make telephone calls, receive paychecks on time, and reserve tickets for travel, hotels, and entertainment. In business and industry, computer systems perform countless tasks—from maintaining business records to controlling manufacturing processes.

A computer system consists of a central processing unit and additional equipment such as remote terminals and high-speed printers. Keeping this intricate equipment in good working order is the job of the computer service technician.

At regular intervals, computer service technicians (often called field engineers or customer engineers) service machines or systems to keep them operating efficiently. They routinely adjust, oil, and clean mechanical and electromechanical parts. They also check electronic equipment for loose connections and defective components or circuits.

When computer equipment breaks down, technicians must quickly find the cause of the failure and make repairs. Determining where in the system the malfunction has occurred is the most difficult part of the technician's job, and requires a logical, analytical mind as well as technical knowledge. As computer systems have grown more complex and networks of minicomputers (mini's) have developed, the potential for malfunctions also has grown.

Breakdowns can occur in the central processing unit itself, in one of the peripheral machines, such as a reader or a printer, in the remote mini's that are connected to the central unit, or in the cables or datacommunications hookups that connect these machines. To locate the cause of electronic failures, technicians use several kinds of tools, including voltmeters, ohmmeters, and oscilloscopes. They run special diagnostic programs that help pinpoint certain malfunctions. Although it may take several hours to locate a problem, fixing the equipment may take just a few minutes. To replace a faulty circuit board, solder a broken connection, or repair a mechanical part, technicians use a variety of handtools, including needle-nosed pliers, wirestrippers, and soldering equipment. The employer supplies tools and test equipment, but technicians are responsible for keeping them in good working order.

Computer technicians often help install new equipment. They lay cables, hook up electrical connections between machines, thoroughly test the new equipment, and correct any problems before the customer uses the machine.

Some technicians specialize in maintaining a particular computer model or system, or in doing a certain type of repair. For example, some technicians are experts in correcting problems caused by errors in the computer's internal programming.

Besides knowing how to use specialized tools and test equipment, computer technicians must be familiar with technical and repair manuals for each piece of equipment. They also must keep up with the technical information and revised maintenance procedures issued periodically by computer manufacturers.

Technicians keep a record of preventive maintenance and repairs on each machine they service. In addition, they fill out time and expense reports, keep parts inventories, and order parts.

Although technicians spend most of their time working on machines, they work with people also. They listen to customers' complaints, answer questions, and sometimes offer technical advice on ways to keep equipment in good condition. Experienced technicians often help train new technicians and sometimes have limited supervisory duties.

## Working Conditions

Computer installations generally run around the clock and working time lost because of a breakdown can be very expensive. For this reason, technicians must be available to make emergency repairs at any time, day or night. Although the normal workweek is 40 hours, overtime is commonplace. The method of assigning overtime varies by employer. Some technicians are on call 24 hours a day. Others work rotating shifts—days one week, nights the next.

For most technicians, travel is local; they usually are not away from home overnight. Employers pay for travel, including reimbursement for job-related uses of the technician's car, as well as work-related education expenses.

Although some bending and lifting are necessary, the job is not strenuous. Work hazards are limited mainly to minor burns and electric shock, but these can be avoided if safety practices are followed.

## Employment

In 1980, about 83,000 persons worked as computer service technicians. Most were employed by firms that provide maintenance services for a fee and by manufacturers of computer equipment. A small number were employed directly by organizations that have large computer installations.

Computer technicians generally work out of regional offices located in large cities, where computer equipment is concentrated. Most are assigned to several clients, depending on the technician's specialty and the type of equipment the user has. Workers with several accounts must travel from place to place to maintain these systems and to make emergency repairs. In some cases, more than one technician will share an account and service different parts of a system. In other cases, an experienced technician may be assigned to work full time at a client's installation in order to maintain all phases of that operation. Technicians who work for a nationwide organization must sometimes transfer to another city or State.

## Training, Other Qualifications, and Advancement

Most employers require applicants for technician trainee jobs to have 1 to 2 years' post-high school training in basic electronics or electrical engineering. This training may

Locating the problem often is more difficult than making the repair.

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be from a public or private vocational school, a college, or a junior college. Basic electronics training offered by the Armed Forces is excellent preparation for technician trainees.

A high school student interested in becoming a computer service technician should take courses in mathematics and physics. High school courses in electronics and computer programming also are helpful. Hobbies that involve electronics, such as operating ham radios or building stereo equipment, also provide valuable experience.

Besides technical training, applicants for trainee jobs must have good vision and normal color perception to work with small parts and color-coded wiring. Normal hearing is needed since some breakdowns are diagnosed by sound. Because technicians usually handle jobs alone, they must have the initiative to work without close supervision. Also important are a pleasant personality and neat appearance, since the work involves frequent contact with customers. Patience is an asset, because some malfunctions occur infrequently and are very difficult to pinpoint. In some companies, applicants must pass a physical examination. A security clearance may be required in cases where technicians regularly service machines located in restricted buildings, such as Federal Government installations engaged in classified activities.

Trainees usually attend company training centers for 3 to 6 months to learn elementary computer theory, computer math, and circuitry theory and to further their study of electronics. Classroom work is accompanied by practical training in operating computer equipment, doing basic maintenance, and using test equipment to locate malfunctions.

In addition to formal instruction, trainees must complete 6 months to 2 years of on-the-job training. At first, they work closely with experienced technicians, learning to maintain card readers, printers, and other machines that are relatively simple, but that have the basic mechanical and electronic features of a large computer system. As trainees gain experience, they work on more complex equipment.

Because manufacturers continually redesign equipment and develop new uses for computers, experienced technicians frequently must attend training sessions to keep up with these changes and to broaden their technical skills. Many technicians take advanced training to specialize in a particular computer system or type of repair. Instruction also may include programming, systems analysis, and other subjects that improve the technician's general knowledge of the computer field.

Experienced technicians with advanced training may become specialists or "troubleshooters" who help technicians throughout their territory diagnose difficult problems. They also may work with engineers in designing equipment and developing maintenance procedures. Technicians with leadership ability may become supervisors or service managers.

Most computer equipment operates on the same basic principles, but machines built by different companies may be unique in design and construction. For this reason, technicians may find it difficult to transfer between companies that maintain different brands of equipment. However, because of the pressing need for experienced technicians, many opportunities exist for well-qualified workers to transfer to other firms that handle the same type of computer hardware.

Training and experience in computer maintenance may also help qualify a technician for a job in equipment sales, programming, or management. (See the statements on programmers and manufacturers' salesworkers elsewhere in the *Handbook*.)

## Job Outlook

Employment of computer technicians is expected to grow much faster than the average for all occupations through the 1980's. As the Nation's economy expands, more computer equipment will be used and many more technicians will be needed to install and maintain it. Business, government, and other organizations will buy, lease, or rent additional equipment to manage vast amounts of information, control manufacturing processes, and aid in scientific research. The development of new uses for computers in fields such as education, medicine, and traffic control also will spur demand.

The very strong demand for computer technicians is related to the growing number of computers in operation and the geographic distribution of these computers. Continued reductions in the size and cost of computer hardware will bring the computer within reach of a rapidly increasing number of small organizations. As more and more of these small systems are installed, the amount of time technicians must spend traveling between clients will increase.

Employment of computer service technicians is much less likely to be affected by downturns in business activity than is the case in other fields. Because computer operations are rarely curtailed during economic slumps, employment of computer service technicians should remain relatively stable.

## Earnings

Earnings of computer service technician trainees were about $270 a week in 1980, according to the limited information available. Fully trained workers earned about $385 a week, while senior level technicians with several years' experience earned between $430 and $575 a week.

## Related Occupations

Workers in other occupations who repair and maintain the circuits and mechanical parts of electronic equipment include appliance repairers, automotive electricians, business machine repairers, electronic organ technicians, instrument repairers, radio repairers, radar mechanics, and television service technicians.

## Sources of Additional Information

For general information on careers in computer maintenance, contact the personnel department of computer manufacturers and computer maintenance firms in your area. The State department of education in your State capital can furnish information about approved technical institutes, junior colleges, and other institutions offering postsecondary training in basic electronics. Additional information about these schools is available from:

U.S. Office of Education, Division of Vocational/Technical Education, Washington, D.C. 20202.

Computer and Business Equipment Manufacturer's Association, 1828 L St. NW., Washington, D.C. 20036.

The State employment service office in your area may also be able to provide information about local job opportunities.

# Electric Sign Repairers

(D.O.T. 824.281-018, .683-010 and .684-010)

## Nature of the Work

A common form of advertising for many businesses and products is the electric sign. Electric sign repairers maintain and repair neon and illuminated plastic signs so that they retain their "eye appeal" and attract maximum attention.

When a sign requires service, a repairer drives to its location in a truck, carrying tools and a number of replacement parts. Repairers' trucks are equipped with ladders and boom cranes for work on tall signs or those placed high above the ground. Common sources of sign trouble, such as burned-out bulbs, are easy to fix. However, in some cases, the problem may not be obvious and repairers may use electronic test equipment to determine the cause of a breakdown. Although simple repairs such as replacing bulbs or transformers are made at the site, major repairs of faulty parts, such as broken neon tubing, are made in sign shops.

Repairers inspect signs periodically and do preventive maintenance to locate and correct defects before breakdowns occur. They check signs and remove debris such as birds' nests and accumulated water. They tighten or weld parts that have been loosened by winds; repaint beams, columns, and other framework; and may repaint portions of neon tubing to make the sign more readable. Repairers check, adjust, and lubricate motors, gears, bearings, and other parts of revolving signs.

During periods with few service calls, repairers who work for sign manufacturing companies may help assemble signs. Some repairers also install signs.

Quite often, workers in large sign companies specialize in a particular phase of sign

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repair. These specialists include: *sign electricians, neon tube benders, sign sheet metal workers*, and *plastics fabricators*.

Repairers use common handtools and power tools, such as screwdrivers, pliers, saws, drills, and electric testing devices such as ammeters and voltmeters to locate and fix malfunctioning electric parts. When replacing burned-out parts, such as lamps or flashers in illuminated plastic signs, repairers may refer to wiring diagrams and charts.

Repairers usually must fill out reports noting the date, place, and nature of service calls. They also may estimate the cost of service calls and sell maintenance contracts to sign owners.

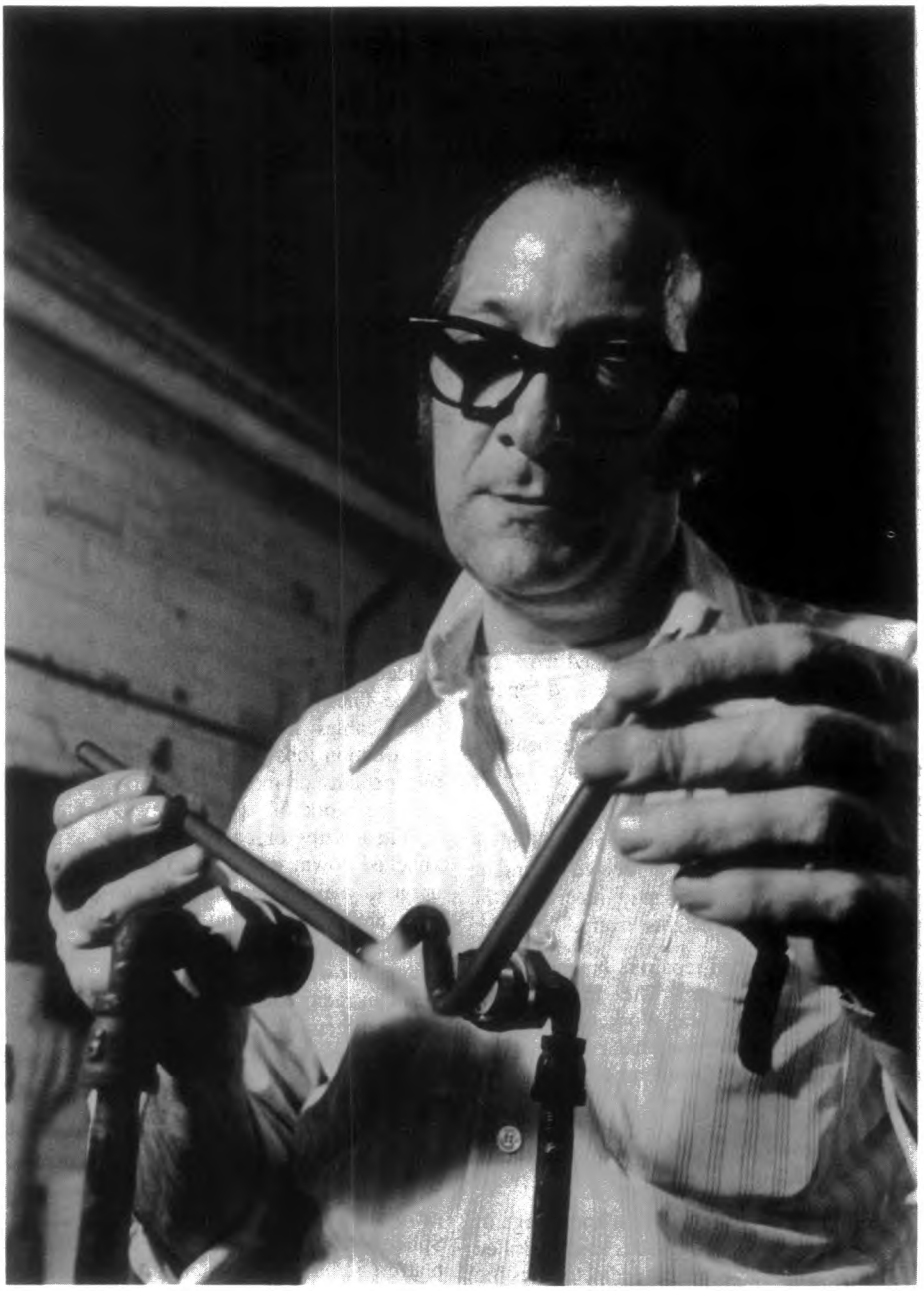
## Working Conditions

Because most signs are out-of-doors, repairers are exposed to all kinds of weather. They sometimes make emergency repairs at night, on weekends, and on holidays. They may spend much time traveling to the site of a service call. In some large cities, repairers patrol areas at night to locate and fix improperly operating signs. The work can be dangerous; hazards include electric shocks, burns, and falls from high places. Training programs emphasizing safety and equipment that allows easy access to signs—such as baskets on boomtrucks—have reduced the frequency of accidents.

## Employment

An estimated 16,000 persons worked as electric sign repairers in 1980, primarily in small shops that custom build, install, and service electric signs and advertising displays. Some repairers worked for manufacturing firms that make but do not service signs; others worked for service firms that specialize in installation and maintenance.

Electric sign repairers work throughout the country. However, employment is concentrated in large cities and in populous States, where large numbers of electric signs are used.



There is much call in the sign industry for neon tube repair.

## Training, Other Qualifications, and Advancement

Most electric sign repairers learn the trade informally on the job. Initially, they work in the shop and learn such tasks as cutting and assembling metal and plastic signs, mounting neon tubing, wiring signs, and installing electric parts. After they have mastered sign construction, trainees accompany experienced repairers on service calls to learn repair and maintenance techniques. At least 4 years of on-the-job training and experience are required to become a fully qualified repairer.

Some people learn the trade through sign repairer or electrician apprenticeship programs conducted by union locals and sign manufacturing shops. Apprenticeships usually last 4 years, emphasize on-the-job training, and include classroom instruction in subjects such as the theory of electricity and blueprint reading. Apprentices generally must be at least 18 years old with a high school diploma. Unions and the National Electric Sign Association are trying to increase the number of apprenticeship programs, so the availability of this type of training should increase in the future.

Employers prefer to hire high school or vocational school graduates, although many repairers have less education. Courses in mathematics, science, electronics, and blueprint reading are helpful to young people who are interested in learning this trade.

Repairers need good color vision because electric wires are frequently identified by color. They also need manual dexterity to handle tools and physical strength to lift transformers and other heavy equipment. Because much of their work is done on ladders or from the baskets of boomtrucks, repairers cannot be afraid of heights.

All electric sign repairers must be familiar with the National Electric Codes. Many cities require repairers to obtain a license by passing an examination in local electric codes, and in electric theory and application.

Highly skilled repairers may become supervisors. After gaining experience in servicing signs and dealing with customers, some repairers become sign sales representatives. Those with sufficient funds may also open their own sign manufacturing or repair shops.

## Job Outlook

Employment of electric sign repairers is expected to increase as fast as the average for all occupations through the 1980's, as the number of signs and advertising displays con-

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tinues to grow. More signs will be needed as new businesses open and old businesses expand and modernize. Signs already in use will continue to require service because well-maintained signs are good for business. Also, many State and local governments require owners to keep signs and advertising displays attractive. In addition to new jobs created by growth in demand for sign repairers, some openings will arise as experienced workers transfer to other occupations, retire, or die.

The sign and advertising display industry is sensitive to downturns in the economy. However, when orders for new signs decline during recessionary periods, sign companies normally intensify efforts to obtain maintenance work and therefore usually avoid major layoffs.

## Earnings

Earnings of electric sign repairers compare favorably with those of other skilled workers. The hourly wage rate of experienced repairers was about $10.00 in 1980, based on a survey of union wages and fringe benefits throughout the country. Apprentice rates ranged from $4.00 to $9.50 an hour.

Most electric sign repairers work an 8-hour day, 5 days a week, and receive premium pay for overtime. They may receive extra pay for working at heights over 30 feet.

Many electric sign repairers belong to one the following unions: The International Brotherhood of Electrical Workers, the Sheet Metal Workers International Association, and the International Brotherhood of Painters and Allied Trades.

## Related Occupations

Electric sign repairers have a knowledge of electric theory and electric codes and are skilled in the use of handtools and electric testing equipment. Workers in other occupations that require similar knowledge and skills include automotive electricians, cash register servicers, coin-machine servicers and repairers, conveyor maintenance mechanics, electrical appliance repairers, furnace repairers, household appliance installers, laundry machine mechanics, aircraft accessory mechanics, and automatic pinsetter mechanics.

## Sources of Additional Information

For information on employment opportunities in your community, contact local sign manufacturing shops, the local office of the State employment service, or locals of the unions previously mentioned.

General information on job opportunities and the nature of the work is available from:

National Electric Sign Association, 1st American Bank Building, 700 Princess St., Alexandria, Va. 22314.

# Line Installers and Cable Splicers

(D.O.T. 821.261-014 and .361-010, 822.361-010 and .381-014, 829.361-010 and -014 and .667-010)

## Nature of the Work

The vast network of wires and cables that connect telephone central offices to each other and to customers' telephones and switchboards is constructed and maintained by line installers and cable splicers and their helpers.

To construct new telephone lines, *line installers*, sometimes called outside plant technicians or construction line workers, place wires and cables that lead from the central office to customers' premises. They use power-driven equipment to dig holes and set in telephone poles that support cables. Line installers climb the poles or use truck-mounted buckets (aerial work platforms) to attach the cables, usually leaving the ends free for cable splicers to connect later. In cities where telephone lines are below the streets, installers place cables in underground conduits. On construction jobs, installers work in crews of two persons or more. A supervisor may direct the work of several crews.

When wires or cables break or a pole is knocked down, line installers often are called upon to make emergency repairs. These repairs are most common in parts of the country that have hurricanes, tornadoes, and heavy snowfalls. The linecrew supervisor keeps in radio contact with the central office, which directs the crew to problem locations on the lines. Some installers periodically inspect sections of lines in rural areas and make minor repairs.

After line installers place cables on poles or in underground conduits, *cable splicers*, sometimes called cable splicing technicians, generally complete the line connections. Splicers work on poles, on aerial ladders and platforms, in manholes, or in basements of large buildings. They connect individual wires within the cable and rearrange wires when lines have to be changed. At each splice, they place insulation over the spliced conductor, and seal the splice with a lead sleeve or cover the splice with some other type of protective covering. They fill the cable sheathing on critical transmission routes with compressed air so that leaks in the sheathing can be monitored and repaired.

Splicers also install terminal boxes that connect customers' telephones to outside cables. An innovation in telephone connecting, these terminal boxes are often placed in the basements of apartment buildings or other buildings containing many telephone customers. When a telephone installer wishes to connect or disconnect a customer's telephone, it can be done quickly at the terminal box.

Splicers may also maintain and repair cables, although in many places this is done by a separate group of workers called cable repair technicians. Preventive maintenance work is extremely important, because a single defect in a cable may seriously interrupt service. Many trouble spots are located through air pressure or electrical tests.

## Working Conditions

Line installers and cable splicers usually work outdoors. They must do a lot of climbing and lifting, and often work in stooped and cramped positions underground. They face certain hazards such as falls and electric shocks, but these have been greatly reduced by safety precautions developed over the years. Like all telephone company employees, line installers and cable splicers are subject to 24-hour call. For example, when severe weather damages telephone lines, these workers may be called upon to work long and irregular hours to restore service. At times they may travel to distant locations—and occasionally stay for a period of time—to help restore damaged facilities or build new ones.

## Employment

Telephone companies employed about 70,000 of these workers in 1980, including about 33,000 line installers and 37,000 cable splicers. Nearly all were employed full time.

## Training, Other Qualifications, and Advancement

Line installer is an entry level job. Local hiring policies vary, and some employers no longer require a high school diploma. High school courses are valuable, however, for developing the reading and arithmetic skills essential for understanding company manuals and work orders. Applicants are tested for mechanical aptitude and must have a driver's license to drive company vehicles to work sites. Knowledge of the basic principles of electricity and training in installing telephone systems with the Armed Forces may be helpful. Physical examinations are given, since line and cable work is strenuous, and applicants must be unafraid of heights. The ability to distinguish colors is necessary because wires usually are coded by color. Motivation, self-discipline, and the ability to work in a team are needed to implement work instructions and safety procedures.

Training programs for line installers and cable splicers include classroom instruction as well as on-the-job training. Classrooms are equipped with actual telephone apparatus, such as poles, cable-supporting clamps, and other fixtures to simulate working conditions as closely as possible. Trainees learn to climb poles while keeping their hands free to work. For example, in one classroom exercise, they play catch with a basketball while on the poles. Trainees also are taught safe working practices to avoid falls and contact with power wires. Classroom training, which also includes instruction in electrical codes, blueprint reading, and beginning electrical theory, is followed by on-the-job training. Trainees are as-

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signed to a crew to work with experienced line installers under a line supervisor.

Cable splicers often come from the ranks of line installer-repairers. Applicants take a test for mechanical aptitude and must have a driver's license. Many telephone companies provide 4 to 6 weeks of classes at a training school equipped with standard manholes, cables, and other equipment on which trainees practice; afterwards, training continues on the job for about 2 years.

In addition to the training by telephone companies, line and cable workers may attend a training school provided by manufacturers who sell cable installation equipment to telephone companies. At other times, manufacturers send instructors to the job site.

Some small, independent telephone companies, particularly those in rural areas, do not have adequate facilities to train their employees. Therefore, they may rely on local vocational and technical schools to provide classroom training to craft employees.

Line installers and cable splicers continue to receive training throughout their careers, to qualify for more difficult assignments and to keep up with technological changes. They may receive this continuing education not just from telephone companies, but also from short courses in colleges, universities, private firms, and state telephone associations.

For line installers, advancement may come about through promotion to a more highly skilled telephone craft job such as cable splicer, telephone installer or repairer, or central office repairer. Promotion to a supervisory position also is possible. Line supervisors manage the work of the crew and must be able to demonstrate and explain skills to new workers.

Cable splicers may transfer to other telephone craft jobs, such as central office equipment installer or PBX installer, or may move into other kinds of work, such as sales. Promotion also is possible to crew supervisor or instructor of new employees.

Line installers and cable splicers need to be safety conscious.

## Job Outlook

Employment of line installers and cable splicers is expected to show little change through the 1980's. Mechanical improvements, such as plows that can dig a trench, lay cable, and cover it in a single operation, have eliminated much of the heavier physical work of the linecrews and have caused reductions in crew size. Also, satellites and other electronic devices such as microwave systems are expected to carry an increasing volume of telephone traffic, thus reducing the emphasis on cable installation. New kinds of splices and the telephone splicing van that uses a self-contained engine to heat and ventilate manholes and drive power tools and equipment will continue to improve the efficiency of cable splicers, thus limiting the need for additional workers. The position of helper to cable splicers and line installers is being phased out. Thus there will be few openings in this area.

Nevertheless, some employment growth may occur due to the need to modernize old cables or replace them with new waterproof ones. In addition, some job openings will occur as experienced workers transfer to other occupations, retire, or die.

Although technological advances have reduced labor requirements in these and other telephone crafts, layoffs are rare. Unneeded workers usually are given a choice: They can transfer to other geographic areas where they are needed, or be retrained and placed in another job. Telephone companies lay off workers only as a last resort and have done so infrequently in recent years. The policy of preference for company employees may however limit the number of job openings available to others over the coming decade.

## Earnings

Pay rates for line installers and cable splicers vary greatly across the country; specific information may be obtained from local telephone companies. Earnings also depend on length of service. It generally takes 5 years to go from the bottom to the top of the pay scale. In 1980, average hourly pay for line installers was $9.30; for cable splicers, $10.28; and for cable splicers' helpers, $7.38. By comparison, nonsupervisory workers in all private industry, except farming, averaged $6.66 an hour.

Most line installers and cable splicers belong to unions, principally the Communications Workers of America, the International Brotherhood of Electrical Workers, and the Telecommunications International Union. For these workers, union contracts set wage

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rates, wage increases, and the time needed to advance from one step to the next. These contracts require extra pay for work beyond the normal 8 hours a day or 5 days a week, and for all work on Sundays and holidays. Most contracts provide for additional pay for nightwork. Time in service determines the length of paid vacations. In general, contracts provide for a 1-week vacation beginning with 6 months of service; 2-weeks for 1 to 6 years; 3-weeks for 7 to 14 years; 4-weeks for 15 to 24 years; and 5-weeks for 25 years and over. Depending on the locality there are 9 to 11 holidays a year. Other provisions in contracts include the following: Paid sick leave; group life, medical, and dental insurance; sickness and accident benefits; retirement and disability pensions; a savings plan; and an employee stock ownership plan.

## Related Occupations

Workers in other skilled crafts and trades who do manual work with tools and machines include automobile mechanics, biomedical equipment technicians, carpenters, cement masons, electricians, machinists, plumbers, sound technicians, toolmakers, and welders.

## Sources of Additional Information

For more details about employment opportunities, contact the telephone company in your community or local offices of the unions that represent telephone workers. For general information on line installer and cable splicer jobs, write to:

International Brotherhood of Electrical Workers, 1125 15th St. NW., Suite 1201, Washington, D.C. 20005.

Telecommunications International Union, P.O. Box 5462, Hamden, Conn. 06518.

For general information on the independent (non-Bell) telephone industry and career opportunities in it, request copies of "Independent Phonefacts" and "Is It for You? A Career in the Independent Telephone Industry" from:

United States Independent Telephone Association, 1801 K St. NW., Suite 1201, Washington, D.C. 20006.

# Maintenance Electricians

(D.O.T. 729.381-018; 820.261, .381-010; 821.381-014; 822.261-010, -018; 824.281-010, .381-010, .681-010; 825.281 except -038, .381; 828.381-010; 829.281-014, .361-010, and -014; 952.381-010; and 962.381-014)

## Nature of the Work

Maintenance electricians keep lighting systems, transformers, generators, and other electrical equipment in good working order. They also may install new electrical equipment. (Construction electricans, who assemble, install, and wire electrical systems, are discussed elsewhere in the *Handbook*.)

Duties vary greatly, depending on where the electrician is employed. Electricians who work in large factories may repair particular items such as motors and welding machines. Those in office buildings and small plants usually fix all kinds of electrical equipment. Regardless of location, electricians spend much of their time doing preventive maintenance—periodic inspection of equipment to locate and correct defects before breakdowns occur. When trouble occurs, they must find the cause and make repairs quickly to prevent costly production losses. They may advise management whether continued operation of equipment would be hazardous.

Maintenance electricians make repairs by replacing items such as a lamp, socket, lens, fuse, switch, or wire. When replacing a wire, they first make sure the power is off. Workers then pull the old wire from the conduit (a pipe or tube) and pull the new wire through to replace the old. Once the new wire is connected, they test to make sure the circuit is complete and functioning properly.

Maintenance electricians sometimes work from blueprints, wiring diagrams, or other specifications. They use meters and other testing devices to locate faulty equipment. To make repairs they use pliers, screwdrivers, wirecutters, drills, and other tools.

## Working Conditions

During a single day, an electrician may repair equipment both in a clean, air-conditioned office and on a factory floor, surrounded by the noise, oil, and grease of machinery. Electricians often climb ladders or work on scaffolds in awkward or cramped positions.

Because maintenance electricians work near high-voltage industrial equipment, they must be alert and accurate. Errors in wiring installations could endanger both the electrician and other employees. Safety principles, which are a part of all electrician training programs, have reduced the frequency of accidents. Electricians are taught to use protective equipment and clothing, to respect the destructive potential of electricity, and to fight small electrical fires.

## Employment

About 270,000 maintenance electricians were employed in 1980. About half of them worked in manufacturing industries; large numbers worked in plants that make automobiles, ships, machinery, chemicals, and iron and steel. Many maintenance electricians also were employed by public utilities, mines, railroads, and Federal, State, and local governments. Some were self-employed contractors. Like the general population, maintenance electricians are concentrated in industrialized and urban areas.

Maintenance electricians spend much of their time testing equipment.

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## Training, Other Qualifications, and Advancement

Maintenance electricians may learn their trade on the job or through formal apprenticeship programs. A relatively small number learn the trade in the Armed Forces. Training authorities generally agree that apprenticeship gives trainees more thorough knowledge of the trade and improved job opportunities during their working life. Because the training is comprehensive, people who complete apprenticeship programs may qualify either as maintenance or construction electricians. Apprenticeship usually lasts 4 years, and consists of on-the-job training and related classroom instruction in subjects such as mathematics, electrical and electronic theory, and blueprint reading. Training may include motor repair, wire splicing, installation and repair of electronic controls and circuits, and welding and brazing.

Some people learn the trade informally on the job by serving as helpers to skilled maintenance electricians. Helpers begin by doing simple jobs such as replacing fuses or resetting switches and, with experience, advance to more complicated jobs such as splicing and connecting wires. They eventually get enough experience to qualify as electricians. This method of learning the trade, however, may take considerably longer than 4 years.

Persons interested in becoming maintenance electricians can obtain a good background by taking high school or vocational school courses in electricity, electronics, algebra, mechanical drawing, shop, and science. To qualify for an apprenticeship program, an applicant must be at least 18 years old and usually must be a high school or vocational school graduate with 1 year of algebra.

Although physical strength is not essential, manual dexterity, agility, and good health are important. Good color vision is necessary because electrical wires frequently are identified by color.

All maintenance electricians should be familiar with the National Electric Code and local electric and building codes. Many localities require maintenance electricians to be licensed. Electricians can get a license by passing an examination that tests their knowledge of electrical theory and its application.

Some maintenance electricians become supervisors. Occasionally, they advance to jobs such as plant electrical superintendent or plant maintenance superintendent. Some start their own contracting businesses, which requires a license in many areas.

## Job Outlook

Employment of maintenance electricians is expected to increase about as fast as the average for all occupations through the 1980's. As the economy grows, more electricians will be needed to maintain electrical systems used by industry. In addition to new jobs created by the increased need for these workers, many openings will arise each year to replace experienced electricians who leave the occupation, retire, or die.

Employment of maintenance electricians is less sensitive to ups and downs in the economy than employment of construction electricians. However, some maintenance electricians may be laid off during recessions, particularly electricians working in the automobile, steel, and other industries that are sensitive to cyclical swings in the economy.

When construction activity is depressed, beginners may face stiff competition for job openings because some unemployed construction electricians apply for these openings. Opportunities may be more favorable in the South and West than in other regions of the Nation.

## Earnings

In 1980, based on a survey of metropolitan areas, maintenance electricians averaged $10.18 an hour, compared with $6.66 an hour for all nonsupervisory and production workers in private industry, except farming. Earnings of maintenance electricians varied by location, with the lowest wages in the Northeast and South and the highest wages in the Midwest and West.

Apprentices start at about 40 or 50 percent of the skilled electrician's hourly pay rate and generally receive increases every 6 months.

Among unions organizing maintenance electricians are the International Brotherhood of Electrical Workers; the International Union of Electrical, Radio and Machine Workers; the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (Ind.); and the United Steelworkers of America.

## Related Occupations

Maintenance electricians combine manual skill and a knowledge of electricity to clean, repair, and replace electrical devices. Other workers who have similar skills are air-conditioning installers, construction electricians, electrical appliance repairers, electronics mechanics, elevator constructors, and line and cable installers.

## Sources of Additional Information

Information about apprenticeships or other work opportunities in the trade is available from local firms that employ maintenance electricians, and from local union-management apprenticeship committees. In addition, the local office of the State employment service may provide information about training opportunities. Some State employment service offices screen applicants and give aptitude tests.

For general information about the work of electricians, contact:

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

National Electrical Contractors Association, 7315 Wisconsin Ave., Bethesda, Md. 20814.

National Association of Lighting Maintenance Contractors, 313 Price Place, Suite 110, Madison, Wis. 53705.

Independent Electrical Contractors, Inc., 1101 Connecticut Ave. NW., Suite 700, Washington, D.C. 20036.

National Joint Apprenticeship and Training Committee for the Electrical Industry, 9700-E George Palmer Hwy., Lanham, Md. 20706.

# Telephone and PBX Installers and Repairers

(D.O.T. 822.261-022, .281-018 and -022, and .381-018)

## Nature of the Work

Telephone and PBX installers and repairers are craft workers who install, service, and repair telephones and switchboard systems on customers' property. Sometimes referred to as services and systems technicians, they generally travel to customers' homes and offices in vehicles equipped with telephone tools and supplies. When customers move or request new types of service, installers relocate telephones or make changes on existing equipment. For example, they may install a switchboard in an office, or change a two-party line to a single-party line in a residence. Installers also may fill a customer's request to add an extension in another room, or to replace an old telephone with a new model.

*Telephone installers*, sometimes called station installers, install and remove telephones in homes and business places. They connect telephones to outside service wires and sometimes must climb poles to make these connections. Occasionally, especially in apartment buildings, the service wires or terminals are in the basement of the building. In many large building complexes, these wires or terminals are located in wire closets.

*PBX installers* specialize in more complex telephone system installations. They connect wires from terminals to switchboards and make tests to check their installations. Some PBX installers also set up equipment for mobile radiotelephones, data processing equipment, and telephone switchboard systems for radio and television broadcasts that receive phone calls from the audience.

*Telephone repairers*, assisted by trouble locators in the central office, locate trouble on customers' equipment. A repairer finds the source of the problem by connecting a test set to the customer's telephone line and then testing in conjunction with the trouble locator in the central office.

*PBX repairers*, with the assistance of trouble locators, locate trouble on customers' PBX, CENTREX, or other telephone systems and make the necessary repairs. They also maintain associated equipment such as batteries, relays, and powerplants.

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Some PBX repairers maintain and repair equipment for radio and television broadcasts, mobile radiotelephones, and data processing equipment.

## Working Conditions

Telephone and PBX installers and repairers work in many kinds of places, both indoors and outdoors, and in all kinds of weather. Their work involves lifting, climbing, reaching, stooping, crouching, and crawling. Because telephone service must be maintained at all times, these workers are subject to 24-hour call, as are all telephone company employees. They may be called in to work when breakdowns occur in lines or equipment.

## Employment

Almost 130,000 telephone and PBX installers and repairers were employed in 1980. The vast majority worked full time.

## Training, Other Qualifications, and Advancement

Applicants for the job of telephone installer or repairer must have the ability to learn a craft, and may have to take a mechanical aptitude test. Workers in these jobs must be adept at handling small tools, such as pliers and screwdrivers, and know how to read blueprints and interpret work orders. Local hiring practices vary, but many employers no longer require a high school diploma for telephone craft jobs. However, applicants must be able to read and understand company manuals and directions for telephone installation and repair.

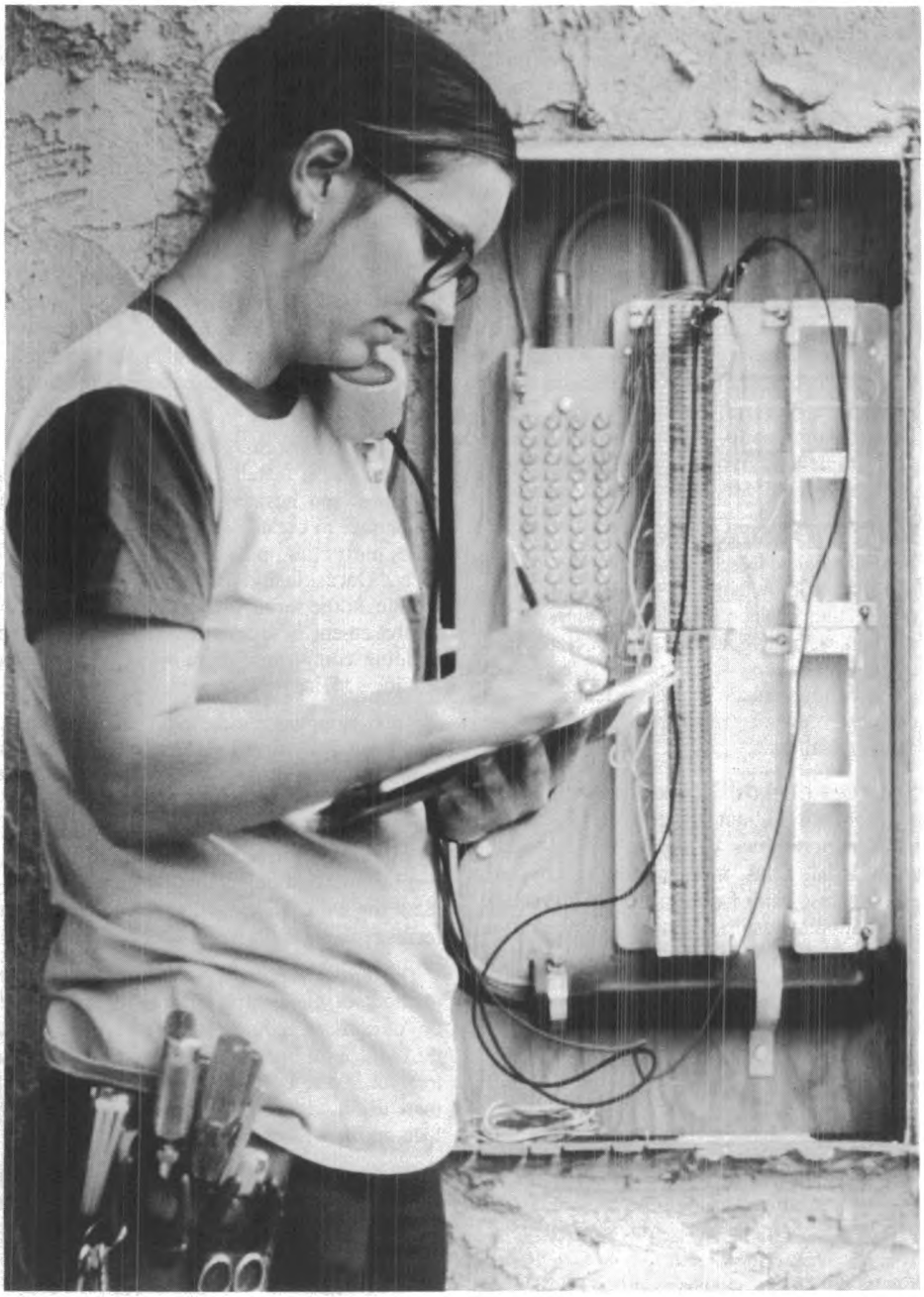
Trainees usually are chosen from the ranks of telephone company employees such as operators, clerical workers, and line installers. A basic knowledge of electricity and electronics, and telephone training in the Armed Forces, are assets in being accepted for training. In addition, applicants must have good eyesight and the ability to distinguish colors. Physical examinations are required because the work may involve strenuous activity such as climbing poles. Practical problem-solving ability is essential, as in all repair jobs. Because these workers deal with the public, a pleasant and patient disposition is an advantage.

Telephone installer-repairer trainees receive classroom instruction in subjects such as electrical and electronic theory. Practical instruction is provided in training facilities equipped with telephone poles, lines and cables, terminal boxes, and other equipment. There, in a simulated work environment, trainees practice installing telephones and connecting wires just as they would on the job. After a month of classroom training, new employees are assigned to assist experienced workers before going out alone to install telephones.

Because many small, independent telephone companies, especially in rural areas, do not have training facilities, they use vocational and technical schools in these areas to train telephone installers and repairers. If travel is required during training—to a regional training school, for example—the company pays the cost.

The jobs of PBX installer or repairer require previous training and experience in the installation of communication equipment. These are not entry level jobs. Often, the necessary experience is obtained as an installer-repairer of telephones in private homes. The new PBX installer usually begins by working with basic PBX equipment and gradually learns, through classroom and on-the-job training, to install increasingly complex apparatus. Further advancement to PBX repairer requires more experience, on-the-job training, and classroom training.

Telephone craftworkers receive training throughout their careers to qualify for more responsible assignments and to keep up with technological changes. Courses are offered by colleges, universities, private firms, and State telephone associations, as well as by the telephone companies themselves. With further training, telephone installer-repairers can advance to supervisor, to sales and customer service jobs or, with additional study of electronics, to more advanced technical jobs such as communications equipment technician.



After putting in a telephone, the installer tests it to be sure that it works properly.

## Job Outlook

Employment of telephone installers and repairers is expected to increase about as fast as the average for all occupations through the 1980's. However, most job openings will arise from the need to replace workers who transfer to other occupations, retire, or die. These openings usually are filled by workers in other telephone jobs, such as operators,

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service representatives, clerks, or drivers, but some should be available to new employees.

Employment will increase due to the growing demand for telephones and PBX and CENTREX systems, a level of demand that is expected to outweigh the effect of technological advance. Employment is expected to increase most rapidly in the Southwest and other areas where the population is growing rapidly. Communities near military bases or colleges, where there is substantial movement in and out, will continue to provide relatively strong demand for telephone installations and removals.

Technological improvements will nonetheless continue to limit employment growth for telephone craftworkers during the 1980's. Telephone installation and repair are becoming less labor intensive as a result of changes such as wiring buildings for telephone service during construction so that, later on, the customer may select a telephone, take it home, and plug it in—effectively eliminating the functions of the installer. The modular assembly of telephones, where components plug in and out, is reducing the time and skills needed for repair.

## Earnings

Pay scales vary greatly across the country; specific information may be obtained from local telephone companies. Earnings also depend on length of service. Generally, it takes 4 or 5 years to progress from the beginning rate to the top of the pay scale. In 1980, average hourly pay for telephone and PBX installers and repairers was $9.90. By comparison, average hourly earnings for nonsupervisory workers in all private industries, except farming, were $6.66.

Most telephone and PBX installers and repairers belong to unions, principally the Communications Workers of America, the International Brotherhood of Electrical Workers, and the Telecommunications International Union. Union contracts govern wage rates, wage increases, and the time needed to progress from one grade to the next. Contracts stipulate extra pay for work performed beyond the normal 8 hours a day or 5 days a week, as well as for that performed on holidays and Sundays. Most contracts provide a pay differential for nightwork. Paid vacations are granted according to length of service. Normally, contracts provide for a 1-week vacation beginning with 6 months of service; 2 weeks for 1 to 6 years; 3 weeks for 7 to 14 years; 4 weeks for 15 to 24 years; and 5 weeks for 25 years and over. Depending on the locality, holidays range from 9 to 11 days a year. Other benefits include the following: Paid sick leave; group life, medical, and dental insurance; sickness and accident benefits; retirement and disability pensions; a savings plan; and an employee stock ownership plan.

## Related Occupations

Other skilled workers whose jobs require manual dexterity and technical knowledge of tools and machines include automobile mechanics, biomedical equipment technicians, carpenters, cement masons, electricians, machinists, plumbers, sound technicians, toolmakers, and welders.

## Sources of Additional Information

For more details about employment opportunities, contact the telephone company in your community or local offices of the unions that represent telephone workers. For general information on telephone and PBX installer and repairer jobs, write to:

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

Telecommunications International Union, P.O. Box 5462, Hamden, Conn. 06518.

For general information on the independent (non-Bell) telephone industry and career opportunities in it, request copies of "Independent Phonefacts" and "Is It for You? A Career in the Independent Telephone Industry" from:

United States Independent Telephone Association, 1801 K St. NW., Suite 1201, Washington, D.C. 20006.

# Television and Radio Service Technicians

(D.O.T. 720.281)

## Nature of the Work

Television and radio service technicians repair a large and growing number of home electronic products, of which television sets and radios are the most numerous. Stereo components, tape recorders, video games and disk players, home security systems, closed circuit televisions, and even electronic organs are repaired by these technicians. Some service technicians specialize in repairing one kind of equipment—for example, television sets or car radios. Others repair several types—television sets, video tape machines, intercoms, and public address systems.

Electronic equipment may operate unsatisfactorily for many reasons, such as defective parts, faulty circuits, or poor connections. Service technicians must check and evaluate each possible cause of trouble. They begin by detecting common causes such as loose connections or defective components. Talking to customers may help technicians identify the problem.

When routine checks do not locate the trouble, technicians refer to wiring diagrams and service manuals that show connections and provide information on how to locate problems. Using test equipment, such as voltmeters, oscilloscopes, signal generators, and frequency counters, they check circuits. For example, they may measure voltages or wave forms in the circuits of a television set for unusual or irregular measurements that indicate the faulty parts. To make repairs, technicians replace faulty parts or make adjustments, such as focusing and converging the picture or correcting the color balance of a television set. In their work, technicians use pliers, soldering irons, wire cutters, and other handtools. Technicians who make customer service calls carry solid-state components, modules, and other parts that can be easily replaced in the customer's home.

Self-employed service technicians have managerial responsibilities in addition to their regular duties. They have to order equipment and supplies, keep records, and supervise other technicians.

## Working Conditions

Service technicians work in shops or customers' homes and working conditions generally are good. They usually work alone and receive little supervision. Technicians who service television sets in homes may do considerable driving. Hazards in the trade include electrical shock and strains from lifting and carrying.

Service technicians generally work 40-44 hours per week, usually in 5 or 5 1/2 days.

## Employment

About 83,000 people worked as radio and television service technicians in 1980. More than one-third were self-employed, a larger proportion than in most skilled trades. Most service technicians, either self-employed or working for others, worked in television repair shops and stores that sell and service television sets, radios, and other electronic products.

Television and radio service technicians work in almost every city. Geographically, employment is distributed in much the same way as the Nation's population.

## Training, Other Qualifications, and Advancement

Training in electronics generally is required to get an entry level job as a television and radio service technician. High schools, private vocational schools, and junior colleges offer training in television and radio repair. Programs in these schools include subjects such as mathematics, physics, schematic reading, electricity, and hands-on work with television sets, radios, and other equipment. The training lasts from 1 to 2 years.

The military services offer training and work experience that are very useful in civilian electronics work. However, additional training in television electronics may be required by employers.

A few television and radio service technicians complete 3- or 4-year formal apprenticeship programs.

New technicians usually begin by working in the shop or in the field under the supervision of an experienced worker. Large repair stores may provide in-house training combined with home study to familiarize new workers with particular brands and models of equipment.

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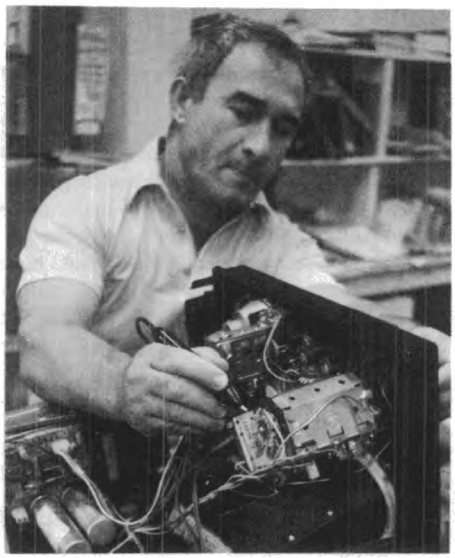

Service technicians must check and evaluate every possible cause of trouble.

Technicians must keep abreast of changes in technology. Manufacturers, employers, and trade associations conduct training seminars to teach technicians servicing methods for new models or products. Technicians also keep up with developments by studying manufacturers' service manuals and technical magazines.

Television and radio service technicians must be able to manipulate small parts and tools, and must have good eye-hand coordination, normal hearing, and good eyesight and color perception. Courtesy and tact are essential in dealing with customers.

Some States require radio and television technicians to be licensed. To obtain a license, applicants must pass an examination designed to test their knowledge of electronic circuits and components and their skill in the use of testing equipment.

Service technicians who work in large repair shops may be promoted to supervisor or service manager. Technicians who have sufficient funds may open their own service shops. Some technicians obtain jobs as electronics "troubleshooters" in manufacturing industries or government agencies.

Those planning to go into business for themselves should take some business administration courses, particularly accounting and consumer relations. Those interested in advancing to positions such as electronics technician can improve their opportunities by taking courses in automatic controls, electronic engineering, television engineering, and mathematics.

## Job Outlook

Employment of television and radio service technicians is expected to increase faster than the average for all occupations through the 1980's. In addition to jobs created by increased demand for technicians, openings will result each year from the need to replace experienced workers who change occupations, retire, or die.

Employment of service technicians is expected to increase in response to the growing number of television sets, video games and disk players, radios, phonographs, tape recorders, and other home entertainment products, although improvements in technology will reduce service requirements for these products. Rising population and personal incomes will contribute to this growth. Greater use of electronic products for purposes other than entertainment also is expected. For example, closed circuit television is being used increasingly to monitor production processes in manufacturing plants, to protect buildings, and to bring educational programs into classrooms.

People who enter the occupation should enjoy steady work because the demand for television and radio repair services continues during economic downturns.

## Earnings

Earnings of television and radio service technicians ranged from about $230 to $400 a week in 1980, based on the limited information available. The wide variations in wage rates reflect differences in skill levels, types of employers, and geographic locations.

A few service technicians are members of labor unions. Most of these belong to the International Brotherhood of Electrical Workers.

## Related Occupations

Other occupations in which workers repair electronic equipment include appliance repairers, business machine repairers, computer service technicians, electronics mechanics, and electronic organ technicians.

## Sources of Additional Information

For more information about jobs in this field, contact local shops and stores that service television sets and radios and other electronic equipment. Technical and vocational schools that offer courses in television and radio repair or electronics may provide information about training. In addition, locals of the International Brotherhood of Electrical Workers and the local office of the State employment service may have information about programs that provide training opportunities.

Information about the work of television and radio service technicians is available from:

National Association of Television and Electronic Servicers of America, 5930 S. Pulaski St., Chicago, Ill. 60629.

Electronics Industries Association, 2001 Eye St. NW., Washington, D.C. 20006.

National Electronic Service Dealers Association and the International Society of Certified Electronic Technicians, 2708 West Berry, Fort Worth, Tex. 76109.

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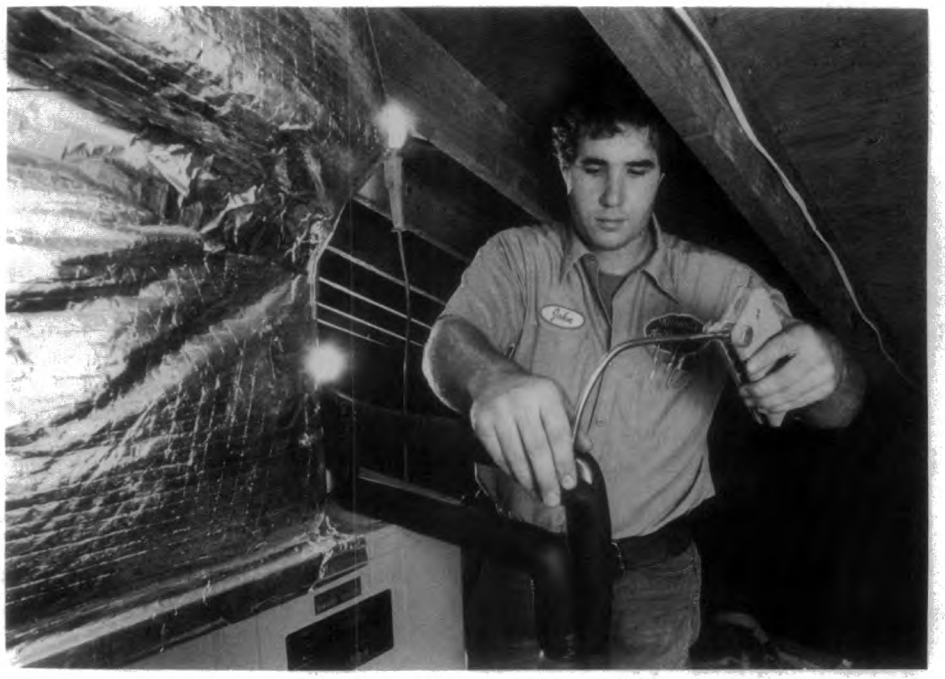
# Air-Conditioning, Refrigeration, and Heating Mechanics

(D.O.T. 637.261-010, -014, -018, -026, and .381-010, -014; 827.361-014 and .464-010; 862.281-018, .361-010; and 869. 281-010)



Air-conditioning mechanics adjust cooling systems to cut down energy use.

## Nature of the Work

People always have sought ways to make their environment more comfortable. Today air-conditioning and heating systems control the temperature, humidity, and even the cleanliness of the air in homes, offices, factories, and schools. In addition, refrigeration systems make it possible to safely store food, drugs, and other perishable items. Air-conditioning, heating, and refrigeration mechanics are skilled workers who install, maintain, and repair such systems.

Air-conditioning, heating, or refrigeration requires more than a single machine. In central air-conditioning systems, for example, fans, compressors, condensers, and evaporators cool and dehumidify the air. Metal ducts or special piping distribute the treated air throughout the building. Mechanics must be able to work with the complete system—the ducts and pipes as well as all the machinery.

Mechanics may specialize in installation or in service—maintenance and repair. Some work only with certain equipment, such as gas furnaces or commercial refrigerators. However, mechanics may do both installation and service and work with cooling, heating, and refrigeration equipment. The following are some specific jobs in this field.

*Air-conditioning and refrigeration mechanics* (D.O.T. 637.261-010,-014,-026; .381-010 and -014; and 827.361-014 and .464-010) install and service central air-conditioning systems and a variety of refrigeration equipment. For air-conditioning or refrigeration systems, mechanics follow blueprints, design specifications, and manufacturers' recommended procedures to install motors, compressors, condensing units, evaporators, and other components. They connect this equipment to the duct work, refrigerant lines, and electrical power source. After making the connections, they charge the system with refrigerant if necessary and check it for proper operation.

When air-conditioning and refrigeration equipment breaks down, mechanics diagnose the cause and make repairs. To find defects they test parts such as compressors, relays, and thermostats. During the winter, air-conditioning mechanics inspect the systems and do required maintenance, such as overhauling compressors. Some air-conditioning and refrigeration mechanics also service heating systems.

*Furnace installers* (D.O.T. 862.361-010 and 869.281-010), also called heating equipment installers, follow blueprints or other specifications to install oil, gas, electric, solid-fuel, and multi-fuel heating systems. After setting the furnace in place, they install fuel supply lines, air ducts, pumps, and other components. They then connect electrical wiring and controls, and check the unit for proper operation.

*Oil burner mechanics* (D.O.T. 862.281-018) keep oil-fueled heating systems in good operating condition. During the fall and winter, when the system is needed most, they service and adjust oil burners. If a system is not operating properly, mechanics check the thermostat, burner nozzles, controls, and other parts to locate the problem. The mechanic corrects the problem by adjusting or replacing parts. During the summer, mechanics do maintenance work, such as replacing oil and air filters and vacuum-cleaning vents, ducts, and other parts of the heating system that accumulate soot and ash.

*Gas burner mechanics* (D.O.T. 637.261-018), also called gas appliance servicers, have duties similar to those of oil burner mechanics. During the winter, they locate malfunctions in gas-fueled heating systems and make necessary repairs and adjustments. During the summer they inspect and clean the heating system to prepare it for the heating season. Some mechanics also repair cooking stoves, clothes dryers, hot water heaters, and outdoor lights and grills.

Air-conditioning, refrigeration, and heating mechanics use a variety of tools including hammers, wrenches, metal snips, electric drills, pipe cutters and benders, and acetylene torches, to work with refrigerant lines and air ducts. They use volt-ohmmeters, manometers, and other testing devices to check electrical circuits, burners, and other components.

Cooling and heating systems sometimes are installed or repaired by other craft workers. For example, on a large air-conditioning installation job, especially where workers are covered by union contracts, duct work might be done by sheet-metal workers; electrical work by electricians; and installation of piping, condensers, and other components by pipefitters. Room air-conditioners and household refrigerators are serviced by appliance repairers. Additional information about these occupations appears elsewhere in the *Handbook*.

## Working Conditions

Mechanics work in homes, office buildings, factories—anywhere there is climate control equipment. They carry their tools and some spare parts to the job sites in trucks that often are equipped with two-way radios. For major repairs mechanics transport broken machinery or parts to the repair shop.

Mechanics may work outside in cold or hot weather or in buildings which are uncomfortable because the air-conditioning or



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heating equipment is broken. Mechanics often work in awkward or cramped positions and sometimes are required to work in high places. Other hazards in this trade include electrical shock, torch burns, muscle strains, and other injuries from handling heavy equipment.

## Employment

Approximately 179,000 persons worked as air-conditioning, refrigeration, and heating mechanics in 1980. Cooling and heating contractors employed most air-conditioning and refrigeration mechanics and furnace installers. Fuel oil dealers employed most oil burner mechanics, and gas utility companies, most gas burner mechanics. Mechanics also work for foodstore chains, school systems, manufacturers, and other organizations that operate large air-conditioning, refrigeration, or heating systems. Approximately 1 out of 6 mechanics is self-employed.

Air-conditioning and refrigeration mechanics, gas burner mechanics, and furnace installers work in all parts of the country. Generally, the geographic distribution of these workers is similar to that of the population. Oil burner mechanics are concentrated in the northeastern States where oil is a major heating fuel.

## Training, Other Qualifications, and Advancement

Most air-conditioning, refrigeration, and heating mechanics start as helpers and acquire their skills by working for several years with experienced mechanics. New workers usually begin by assisting experienced mechanics and doing simple jobs. They may carry materials, insulate refrigerant lines, or clean furnaces. In time, they do more difficult jobs, such as cutting and soldering pipes and sheet metal and checking electrical circuits. In 4 to 5 years new mechanics are capable of doing all types of repairs and installations.

Many high schools, private vocational schools, and junior colleges offer programs in air-conditioning, heating, and refrigeration. Students study air-conditioning, heating, and refrigeration theory and the design and construction of the equipment. They also learn the basics of installation, maintenance, and repair. Although completion of such a program does not assure a job, employers may prefer to hire graduates of these programs because they require less on-the-job training.

Apprenticeship programs are run by unions and air-conditioning and heating contractors. In addition to on-the-job training, apprentices receive 144 hours of classroom instruction each year in related subjects, such as the use and care of tools, safety practices, blueprint reading, and air-conditioning theory. Applicants for apprenticeships must have a high school diploma and pass a mechanical aptitude test. Apprenticeships last 4 years.

When hiring helpers, employers prefer high school graduates with mechanical aptitude who have had courses in mathematics, mechanical drawing, electricity, physics, and blueprint reading. Good physical condition also is necessary because workers sometimes have to lift and move heavy equipment.

To keep up with changes in technology and to expand their skills, experienced mechanics may take courses offered by associations such as the Refrigeration Service Engineers Society, the Petroleum Marketing Education Foundation, and the Air-Conditioning Contractors of America.

Mechanics can advance to positions as supervisors. Those with sufficient money and managerial skill can open their own contracting businesses.

## Job Outlook

Employment of air-conditioning, refrigeration, and heating mechanics is expected to increase about as fast as the average for all occupations through the 1980's. Many openings will occur as experienced mechanics transfer to other fields of work, retire, or die.

Employment of air-conditioning, heating, and refrigeration mechanics will increase as more homes and commerical and industrial buildings are constructed. Installations of new energy-saving heating and air-conditioning systems in existing homes and buildings also will increase employment of mechanics.

Because these trades have attracted many people, beginning mechanics may face competition for jobs as helpers or apprentices. Graduates of training programs that emphasize hands-on experience will have an advantage in getting a job.

Employment of air-conditioning, heating, and refrigeration mechanics usually is not sensitive to downturns in the economy because maintenance of existing systems and installation of new, more efficient equipment in existing buildings make up a large part of their work. Because people and businesses depend on their air-conditioning, heating, and refrigeration systems, the need for mechanics to do maintenance work is strong even during economic downturns.

## Earnings

Hourly rates for experienced air-conditioning, refrigeration, and heating mechanics working under union contracts ranged from $12 to $15 in 1980. In comparison, production and nonsupervisory workers in private industry, except farming, averaged $6.66 an hour. Apprentices receive a percentage of the wage paid experienced workers, about 40 percent at the beginning of their training and about 85 percent during the fourth year. Mechanics who worked on both air-conditioning and heating equipment frequently had higher rates of pay than those who worked on only one type of equipment.

Mechanics usually work a 40-hour week. However, during seasonal peaks they often work overtime or irregular hours. Most employers try to provide a full workweek the year round, but they may temporarily reduce hours or lay off some mechanics when seasonal peaks end. Employment in most shops that service both air-conditioning and heating equipment is fairly stable throughout the year.

Some mechanics are members of the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry or the Sheet Metal Workers International Association.

## Related Occupations

Air-conditioning, heating, and refrigeration mechanics work with sheet metal and piping, and repair machinery, such as electrical motors, compressors, and burners. Other workers who have similar skills are boilermakers, electrical appliance servicers, electricians, pipefitters, plumbers, and sheet metal workers.

## Sources of Additional Information

For more information about employment and training opportunities in this trade, contact local air-conditioning refrigeration, and heating contractors; a local of the union previously mentioned; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency.

For pamphlets on career opportunities and training, write to:

Air-Conditioning and Refrigeration Institute, 1815 N. Fort Myer Dr., Arlington, Va. 22209. (The Institute prefers not to receive individual requests for large quantities of pamphlets.)

Air-Conditioning Contractors of America, 1228 17th St. NW., Washington, D.C. 20036.

For information about training in oil heating systems, write to:

Petroleum Marketing Education Foundation, P. O. Box 11187, Columbia, S.C. 29211.

# Business Machine Repairers

(D.O.T. 633, 706.381-010 and -030)

## Nature of the Work

Business machine repairers maintain and repair the machines that are used to process paperwork in business and government. These machines include typewriters, adding and calculating machines, cash registers, dictating machines, postage meters, and duplicating and copying equipment. (Computer service technicians, who work on data processing equipment, are discussed in a separate statement elsewhere in the *Handbook*.)

Business machine repairers (often called field engineers or customer engineers) make regular visits for preventive maintenance to the offices and stores of customers in their assigned area. The frequency of these service calls depends upon the type of equipment being serviced. For example, an electric typewriter may require preventive mainte-

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nance only three or four times a year, while a complex copier probably would require more frequent attention. During these calls, the engineer inspects the machine for unusual wear and replaces any worn or broken parts. Then the machine is cleaned, oiled, and adjusted to ensure peak operating efficiency and to prevent future breakdowns. The engineer also may advise machine operators how to use the equipment more efficiently and how to spot a problem in its early stages.

Despite frequent maintenance, business machines do occasionally malfunction. When notified of a breakdown, a field engineer promptly goes to the customer's place of business, examines the machine, and determines the cause of the malfuction. Once the problem has been isolated, repairs can be made. Minor repairs generally can be made on the spot; more serious repairs, however, may require that a component or the entire machine be taken to the repair shop.

Business machine repairers generally specialize in one type of machine. Those employed by manufacturing companies or dealers usually are familiar only with the brand produced or sold by their employer. Repairers who work for small independent repair shops must be able to work on equipment from several different manufacturers.

Repairers use common handtools, such as screwdrivers, pliers, and wrenches, as well as other tools especially designed to fit certain kinds of business machines. In addition, they use meters and other types of test equipment to check for malfunctions in electronic circuits.

## Working Conditions

Servicing business machines is cleaner and less strenuous than the work in most other mechanical trades. Repairers generally wear business clothes and do most of their work in the customer's office.

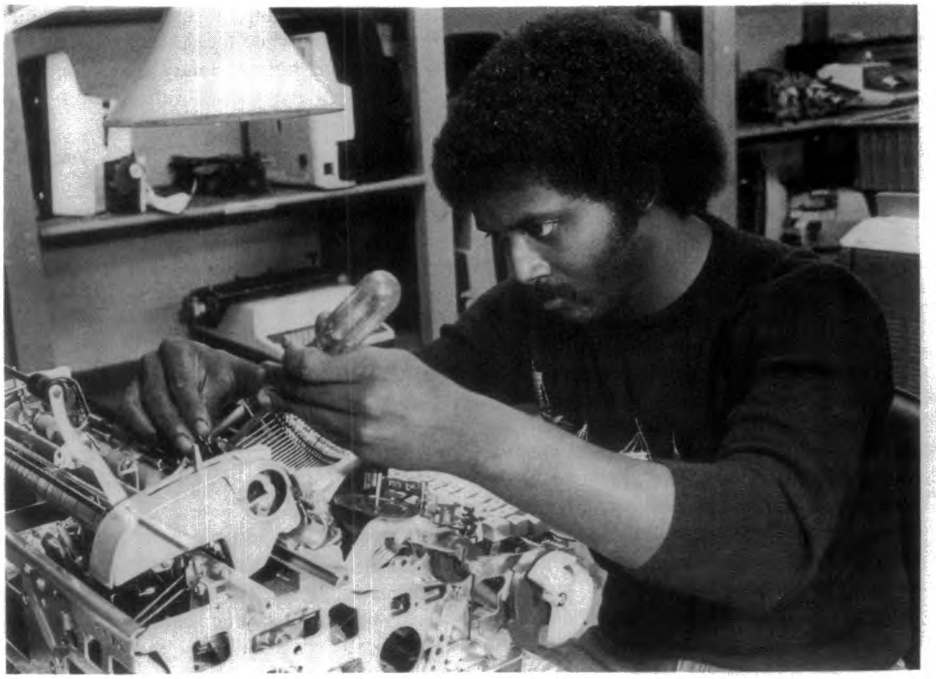
Workers travel a great deal because they usually visit a number of customers each workday. They generally use their own cars and are reimbursed on a mileage basis. Injuries are uncommon.

## Employment

About 55,000 people worked as business machine repairers in 1980. Most worked on typewriters, calculators, adding machines, copiers, and duplicators. Others serviced proof machines in banks, accounting-bookkeeping machines, cash registers, and postage and mailing equipment. A small number repaired dictating machines.

About 8 of 10 repairers work for business machine manufacturers; for firms that provide maintenance services to businesses; or for repair shops. The remainder work for organizations large enough to employ their own staff of full-time repairers.

Business machine repairers work throughout the country. Even relatively small communities usually have at least one or two repair shops. Most repairers, however, work in large cities.



Business machine repair is cleaner and lighter than the work in most mechanical trades.

## Training, Other Qualifications, and Advancement

The amount of formal education required for entry jobs as business machine repairers varies. Some employers hire applicants with a high school education, while many others require at least 1 year of technical training in basic electricity or electronics. Employers agree that electronics training received in the Armed Forces is valuable.

Applicants for entry jobs may have to pass tests that measure mechanical aptitude, knowledge of electricity or electronics, manual dexterity, and general intelligence. Good eyesight, including color vision, is needed to inspect and work on small, delicate parts. Persons considering this type of work should have good hearing to detect malfunctions revealed by sound.

Employers seek applicants who have a pleasant, cooperative manner. Because most machine servicing is done in customers' offices, the ability to work without interrupting the office routine is very important. A neat appearance and ability to communicate effectively are essential.

Business machine repairers must be honest and trustworthy because they sometimes are exposed to large sums of money and other valuables in banks and offices. Some employers require that they be bonded. They must work without direct supervision and must be able to set up maintenance schedules for their customers' equipment and arrange their own schedules so that they can meet service deadlines and also handle emergency repairs.

Trainees who work in a manufacturer's branch office or for a franchised dealer usually attend a school sponsored by the manufacturer. Training programs at company schools usually last several weeks to several months, depending on the type of machine the repairer will service. Trainees then receive from 1 to 3 years of practical experience and on-the-job training before they become fully qualified repairers. These workers generally learn to service only the company's line of equipment.

Independent repair shops usually offer less formal training consisting of a self-study course plus on-the-job instruction the supervision of an experienced repairer. Because small repair shops usually do not specialize in the more sophisticated types of equipment, their repairers are expected to be familiar with the more common machines produced by many manufacturers. For example, business machine repairers in small shops should be able to repair several different makes of typewriters, adding machines, and calculators.

Business machine repairers frequently attend training seminars sponsored by equipment manufacturers for special instruction in new business machines. They also are encouraged to broaden their technical knowledge during nonworking hours. Many companies pay the repairer's tuition for work-related courses in college and technical schools.

Because of their familiarity with equipment, business machine repairers are particularly well qualified to advance to sales jobs as manufacturers' sales workers. Repairers who show management abilities also may become service managers or supervisors. Experienced repairers sometimes open their own repair shops; those who work in manufacturers' branch offices may become independent dealers or buy sales franchises from the company.

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## Job Outlook

Employment of business machine repairers is expected to grow much faster than the average for all occupations through the 1980's, as business and government buy more machines to handle a growing volume of paperwork. In addition to the jobs that will be created by increased demand, many openings will arise each year as experienced repairers transfer to other occupations, retire, or die.

Employment opportunities for qualified beginners are expected to be excellent. In recent years, many technical changes have occurred in business machines. Electronic calculating machines have replaced mechanical models, for example, and electronic cash registers are replacing mechanical registers. Because of the greater use of such equipment, opportunities will be particularly favorable for repairers who have training in electronics.

Business machine repairers have steadier employment than many other skilled workers. Office machines must be maintained even when business slackens, since records must be kept, correspondence processed, and statistical reports prepared.

## Earnings

In 1980, trainees started at about $180 a week, according to the limited information available. Even during training, salaries often are increased as workers advance to more complicated assignments. People who have previous electronics training in the Armed Forces or civilian technical schools generally receive somewhat higher beginning wages than high school gradutates.

Experienced repairers earned from $200 to $250 a week, while highly skilled specialists earned from $300 to $350. Repairers who can work on more than one type of equipment normally earn substantially more than those who are familiar with only one type of machine.

In many areas, earnings for business machine repairers are comparable to those of computer service technicians with similar skills, responsibilities, and experience. (See the statement on computer sevice technicians, a closely related occupation, elsewhere in the *Handbook*.)

## Related Occupations

Other workers who service complicated electronic and mechanical equipment include appliance repairers, automotive electricians, computer service technicians, electronic organ technicians, instrument repairers, radio repairers, radar mechanics, and television service technicians.

## Sources of Additional Information

For more details about job opportunities, contact local firms that sell and service business machines and the local office of the State employment service. The State department of education in your State capital can furnish information about approved technical institutes, junior colleges, and other institutions offering postsecondary training in basic electronics. Additional information about these schools is available from:

U.S. Office of Education, Division of Vocational/Technical Education, Washington, D.C. 20202.

Computer and Business Equipment Manufacturer's Association, 1828 L St. NW., Washington, D.C. 20036.

# Elevator Constructors

(D.O.T. 825.281-030, .361-010, and .664-010)

## Nature of the Work

Elevator constructors, also called elevator mechanics, assemble and install elevators, escalators, and similar equipment. In new buildings, they install equipment during construction. In older buildings, they replace earlier installations with new equipment. Once the equipment is in service, they maintain and repair it. Small crews of skilled elevator constructors and their helpers usually do installation and repair work.

When installing a new elevator, mechanics must prepare the elevator shaft—a vertical opening usually enclosed by masonry or concrete walls that passes through the floors of the building. Working on scaffolding, crews bolt or weld steel T-sections, called guide rails, to the inner walls of the shaft. Rails act as runners to guide the elevator up and down the shaft.

To install electrical wires and controls, mechanics run special metal tubing called conduit along the shaft's walls from floor to floor. Workers then pull plastic-covered electrical wires through the conduit. They install all electrical components and related devices—usually at each floor and at the main control panel in the machine room.

Next, mechanics assemble the steel frame of the elevator car at the bottom of the shaft. The frame parts are bolted or welded together. Guide rollers or guide shoes are attached to the car frame and set into the guide rails of the elevator shaft. The shoes and rollers glide along the machined surfaces of the guide rails to minimize the lateral motion of the car as it travels through the shaft. Workers then install the car's platform, walls, and doors.

Mechanics also install the outer doors and door frames at the elevator entrances on each floor. In most modern elevators, the outer doors are opened and closed by the doors of the elevator car.

For cable elevators, workers install a winch. This giant, electrically powered spool simultaneously winds and unwinds a heavy steel cable that connects the elevator car at one end to its counterweight at the other. As a result, the car and its counterweight move in opposite directions to assist in each other's movement. While the hoist winds the cable from one side to pull the car upward, it also unwinds the cable on the other side for the counterweight to descend. As the weight descends, it helps to pull the car swiftly and smoothly upward.

Some elevator cars are raised and lowered by a hydraulic pump rather than a cable and winch. The car sits on top of a long hydraulic cylinder that is driven by the hydraulic pump. Instead of pulling the car upward, the cylinder pushes the elevator car from underneath.

Elevator constructors employ similar electrical and mechanical skills when constructing escalators. These electrically powered stairs rotate around huge oval tracks that run from floor to floor. Unlike elevators, which run according to specific signals, escalators run continuously. Consequently, escalators require fewer electrical relay systems. In addition, much of the escalator arrives at the job site assembled. For example, the escalator truss, the steel framework that supports the track and steps, is usually assembled by the manufacturer.

In addition to elevators and escalators, constructors install other devices such as dumbwaiters and material lifts, which are similar to elevator in design, and powered walkways, which more closely resemble escalators.

Elevator constructors usually specialize in construction, maintenance, or repair work. Maintenance and repair workers need more knowledge of electricity and electronics than construction crews because a large part of maintenance and repair work is troubleshooting.

Maintenance mechanics, unlike construction and repair workers, are on their own most of the day and typically service the same elevators from week to week. Most of their work is preventive maintenance—oiling and greasing moving parts, testing equipment with meters and gauges, and replacing worn parts. Because they generally are called when a client's elevator malfunctions, they also provide some repair services.

When repairs require more personnel or more time and tools than the maintenance mechanic can provide, the repair crew usually services the elevator. For example, damaged freight elevator doors are a typical problem for repair crews. Repairing and setting doors back on their tracks may take several hours and require a welding machine, cutting torches, and rigging equipment—tools the maintenance mechanic would not normally carry. The repair crew may also replace any damaged electrical parts, adjust doors so that they close properly, and, finally, test the elevator to insure it is running correctly. Repair crews also do major modernization and alteration work such as removing and replacing electrical motors, hydraulic pumps, and control panels.

## Working Conditions

Elevator construction, maintenance, and repair involve lifting and carrying heavy

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equipment and parts. Workers are exposed to the dangers of falls and electrical shocks. Maintenance and repair mechanics often work overtime when repairing essential elevator equipment. They are at times on 24-hour call. This varies, however, based on the amount of work, the number of available mechanics, and company policy.

## Employment

Most of the estimated 17,500 elevator constructors in 1980 were employed by elevator manufacturers to do installation, alteration, maintenance, and repair work. Some were employed by small, local contractors who specialize in elevator maintenance and repair. Still others worked for government agencies or business establishments that do their own elevator maintenance and repair.

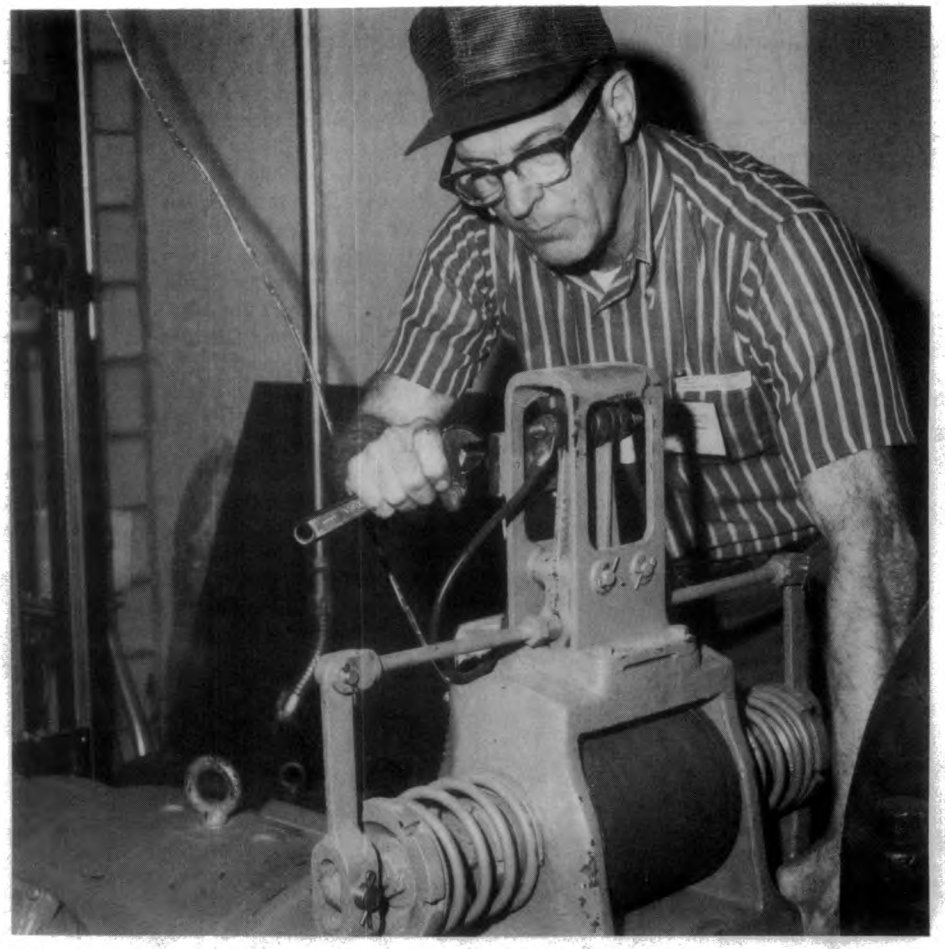
## Training, Other Qualifications, and Advancement

Almost all elevator constructors learn their trade in training programs administered by joint committees of locals of the International Union of Elevator Constructors, elevator manufacturers, and local elevator contractors. These programs combine on-the-job training with classroom instruction in electronic theory, mathematics, applications of physics, and safety techniques. Most trainees, or helpers, begin in the construction industry and are assigned initially to experienced elevator mechanics. Beginning tasks include carrying materials and tools, bolting rails to walls, and assembling elevator cars. Eventually, thniques. Most trainees, or helpers, begin in the construction industry and are assigned initially to experienced elevator mechanics. Beginning tasks include carrying materials and tools, bolting rails to walls, and assembling elevator cars. Eventually, tasks become more complex and require greater knowledge and skill. For example, electrical wiring requires a knowledge of local and national electrical codes and of electronic theory. Later on, helpers test and adjust elevators for optimum performance.

Generally, advancement depends upon the trainee's ability and level of experience. The average trainee usually qualifies as a helper after 6 months of experience and usually becomes a fully qualified elevator constructor within 4 years. Some States and cities require elevator constructors to pass a licensing examination. Many mechanics doing maintenance and repair work continue to receive training from their employers to keep up with the rapid pace of engineering developments in the industry.

Applicants for trainee positions must be at least 18 years old and have a high school or vocational school education; courses in electricity, mathematics, and physics can provide a useful background. Applicants also must pass an aptitude test before training begins. Good physical condition and a high degree of mechanical aptitude are important.

Some constructors advance to jobs as supervisors or elevator inspectors. A relatively small number go into the elevator contracting business.



Elevator mechanic completes preventive maintenance by tightening a bolt.

## Job Outlook

Employment in this small occupation is expected to increase about as fast as the average for all occupations through the 1980's. Growth in the number of high-rise apartment and commercial buildings in metroplitan areas will create job openings, as will the need to replace experienced workers who leave the trade, retire, or die. The relatively small size of the occupation will limit the number of job openings.

Opportunities for elevator mechanics in construction may fluctuate from year to year as economic conditions change. High interest rates usually discourage building activity and will limit the number of job openings for experienced workers as well as for trainees. Economic downturns generally do not affect maintenance and repair mechanics because elevators, escalators, and other lifting devices are critical to businesses and other establishments.

Elevator constructors usually work indoors, so they seldom lose work because of bad weather.

## Earnings

In 1980, union elevator constructors in metropolitan areas had estimated average wages of $13.11 an hour, or twice the average wage paid to production and nonsupervisory workers in private industry, except farming. Hourly wage rates for helpers start at about 50 percent of the rate paid to experienced elevator mechanics and reach 70 percent at the end of the 6-month probation period.

In most areas of the country, construction, maintenance, and repair workers earn the same hourly wage. In New York City, however, construction workers earn a higher hourly wage than other elevator mechanics. Most elevator constructors are members of the International Union of Elevator Constructors.

## Related Occupations

Elevator constructors combine electrical and mechanical skills with construction skills such as welding, rigging, measuring, and blueprint reading. Other occupations that employ many of these skills are electricians, industrial machinery repairers, and structural ironworkers.

## Sources of Additional Information

For further details about work opportunities as a helper in this trade, contact elevator manufacturers, elevator repair and maintenance contractors, or a local of the International Union of Elevator Constructors. In addition, the local office of the State employ-

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ment service may have information about opportunities in this trade.

# Industrial Machinery Repairers

(D.O.T.) 620.281-050, -058, .381-014; 622-381-030; 626; 628.261-010, 281-010, .381-010, .382-010, .484-010, .684-108, -026, -030, -034; 629.280-020; 630.281-038; 631.261-014, -018; 683.684-010, .685-014; and 685.360-010

## Nature of the Work

When a machine breaks down in a plant or factory, not only is the machine idle, but raw materials and human resources are wasted. It is the industrial machinery repairer's job to prevent these costly breakdowns and to make repairs as quickly as possible.

Industrial machinery repairers—often called maintenance mechanics—spend much time doing preventive maintenance. This includes keeping machines well oiled and greased, and periodically cleaning parts. The repairer regularly inspects machinery and checks performance. Tools such as micrometers, calipers, and depth gauges are used to measure and align all parts. For example, treadles on sewing machines in the apparel industry may need adjustment, and gears and bearings may have to be aligned. By keeping complete and up-to-date records, mechanics try to anticipate trouble and service the machinery before the factory's production is interrupted.

When repairs become necessary, the maintenance mechanic must first locate the specific cause of the problem. This challenge requires knowledge reinforced by experience. For example, after hearing a vibration from a machine, the mechanic must decide whether it is due to worn belts, weak motor bearings, or any number of other possibilities.

After correctly diagnosing the problem, the maintenance mechanic disassembles the equipment, and then repairs or replaces the necessary parts. A wide range of tools may be used. For example, repairers may use a screwdriver and wrench to adjust an engine, or a hoist to lift a printing press off the ground. The mechanic's tools often include electronic testing equipment. Repairers use catalogs to order replacements for broken or defective parts. When parts are not readily available, or when a machine must be quickly returned to production, repairers may sketch a part that can be fabricated by the plant's machine shop. Repairers often follow blueprints and engineering specifications in maintaining and fixing equipment.

The repairer reassembles and tests each piece of equipment after it has been serviced, for once it is back in operation, the machine is expected to work as if it were new.

Many of the industrial machinery repairer's duties often are performed by millwrights. (See the statement on millwrights elsewhere in the *Handbook*.)

Regular maintenance can prevent a costly breakdown of industrial machinery.

## Working Conditions

Repairers may work in stooped or cramped positions, to reach the underside of a generator, for example. They also may work from the top of ladders when repairing a large machine. These workers are subject to common shop injuries such as cuts and bruises. In addition to their 9-to-5 work schedule, industrial machinery repairers may be called to the plant at night or on weekends for emergency repairs.

## Employment

Industrial machinery repairers work in almost every industry in which a great deal of machinery is used. Over one-half of the 507,000 repairers employed in 1980 worked in manufacturing industries, primarily in machine shops, printing plants, oil refineries, garment shops, automobile and aircraft companies, and food processing plants.

Because industrial machinery repairers work in a wide variety of plants, they are employed in every section of the country. Employment is concentrated, however, in heavily industrialized areas.

## Training, Other Qualifications, and Advancement

Graduation from high school is preferred, but not always required, for entry into this occupation. High school courses in mechanical drawing, mathematics, blueprint reading, and physics are useful for those interested in entering this trade.

Most workers who become industrial machinery repairers start as helpers and pick up the skills of the trade informally. Some learn the trade through apprenticeship programs

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sponsored by the United Automobile, Aerospace and Agricultural Implement Workers of America and the International Union of Electrical, Radio and Machine Workers. This training usually lasts 4 years and consists of on-the-job training and related classroom instruction in subjects such as shop mathematics, blueprint reading, welding, and safety.

Mechanical aptitude and manual dexterity are important qualifications for workers in this trade. Good physical condition and agility are also necessary because repairers sometimes have to lift heavy objects or climb to reach equipment located high above the floor.

Examinations may be administered periodically to determine the repairer's ability to maintain more advanced machinery. Some repairers are promoted to machinists or tool-and-die makers or become master mechanics.

## Job Outlook

Employment of industrial machinery repairers is expected to increase about as fast as the average for all occupations through the 1980's as manufacturers invest in more industrial machinery. Also, as machinery becomes more complex, repair work and preventive maintenance will become more time consuming. Besides jobs that will be created from increased demand for industrial machinery repairers, many openings will result each year from the need to replace repairers who transfer to other occupations, retire, or die.

Industrial machinery repairers are not usually affected by seasonal changes in production. During slack periods, when some plant workers are laid off, repairers often are retained to do major overhaul jobs.

## Earnings

According to the available data, industrial machinery repairers had average hourly wages of $9.53 in 1980—about one-third higher than the average for all nonsupervisory workers in private industry, except farming. Average hourly earnings of industrial machinery repairers in 12 areas that represent various regions of the country are shown in table 1.

**Table 1. Average hourly earnings of industrial machinery repairers in selected areas, 1980**

| Area | Hourly rate |
|---|---|
| Indianapolis | $11.60 |
| Detroit | 10.98 |
| Baltimore | 10.85 |
| Chicago | 10.11 |
| Houston | 9.97 |
| New Orleans | 9.51 |
| St. Louis | 9.44 |
| Cincinnati | 9.38 |
| Minneapolis–St. Paul | 9.33 |
| New York | 8.32 |
| Worcester, Mass | 7.70 |
| Greenville–Spartanburg, S.C. | 6.48 |

SOURCE: Bureau of Labor Statistics.

Labor unions to which most industrial machinery repairers belong include the United Steelworkers of America; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the International Association of Machinists and Aerospace Workers; and the International Union of Electrical, Radio and Machine Workers.

## Related Occupations

Other occupations which involve repairing machinery include aircraft mechanics, automobile mechanics, bowling-pin-machine mechanics, machinists, millwrights, tool-and-die makers, and vending machine mechanics.

## Sources of Additional Information

Information about employment and apprenticeship opportunities in this field may be available from local offices of the State employment service or the following organizations:

International Union, United Automobile, Aerospace and Agricultural Implement Workers of America, 8000 East Jefferson Ave., Detroit, Mich. 48214.

International Union of Electrical, Radio and Machine Workers, 1126 16th St. NW., Washington, D.C. 20036.

# Millwrights

(D.O.T. 638.261-014, .281-018 and -022)

## Nature of the Work

With the coming of the Industrial Revolution, machines and factories replaced many handcrafts. The textile industry in England was one of the first to use machinery to mass produce its goods. The workers who planned and built the textile mills, and set up the equipment that was needed, were called millwrights. The occupation gradually expanded to other factories, and today the millwright installs and dismantles machinery and heavy equipment used in almost every industry, from food processing to coal mining.

The millwright's responsibilities begin when machinery arrives at the job site. The new equipment must be unpacked and unloaded, inspected for damaged and missing parts, and then moved into position. To lift and move light machinery, millwrights may use rigging and hoisting devices such as pulleys and cables. Moving machinery sometimes requires the assistance of a hydraulic lift-truck operator. In cases where machinery and parts are too heavy for handtools and lift-trucks, millwrights must work with a crane operator, signalling the operator while the crane carries the machinery to its new site.

Because millwrights often choose the devices for moving machinery, they must know the load-bearing properties of ropes, cables, hoists, and cranes. For example, when installing a new oven in a food processing plant, a millwright sets up steel cables and a small hoist to move the oven from the truck on which it arrived to the conveyor that will carry it into the plant. The oven is then lifted, with other hoisting devices and perhaps the aid of a crowbar for leverage, onto a dolly and taken to the foundation for proper positioning.

New machinery sometimes requires a new foundation. Since they either personally prepare or supervise the construction of the foundation, millwrights must know how to read blueprints and work with building materials such as concrete, wood, and steel.

In assembling machinery, millwrights fit bearings, align gears and wheels, attach motors, and connect belts according to the manufacturer's blueprints and drawings. Precision leveling and alignment are important in the assembly process; millwrights must have good mathematical skills so that they can measure angles, material thickness, and small distances with tools such as squares, calipers, and micrometers. In some cases, particularly when lining up conveyor machinery or tracks, a millwright may use laser equipment to "shoot" a straight line over long distances. Millwrights also use hand and power tools, cutting torches, welding machines, and soldering guns. Some millwrights use lathes to grind or turn parts to specifications.

Millwrights may also dismantle machinery or reroute conveyors and tracks. This is more common among manufacturing firms where equipment is often replaced or moved to make better use of factory space.

A millwright is often called a "jack of all trades" because of the variety of skills the job entails. In addition to installing and dismantling machinery, many millwrights repair and maintain equipment. This includes preventive maintenance, such as oiling and greasing, and fixing or replacing worn parts. (For further information on machinery maintenance occupations, see the statement on industrial machinery repairers elsewhere in the *Handbook*.)

Millwrights employed by contract installation and construction companies do a variety of installation work. Those employed in factories usually install only the particular types of machinery used by their employers.

## Working Conditions

Millwrights employed by factories ordinarily work year round. Those employed by construction companies and companies that manufacture and install machinery may experience periods of unemployment; however, they usually are compensated with a higher hourly wage rate. These millwrights may travel long distances every day to and from the job site.

Millwrights are subject to usual shop hazards such as cuts and bruises. They also face injury from falling objects or machinery that is being moved, and from falls when climbing up walkways and platforms to install equipment. These dangers can be reduced by the use of protective devices such as safety belts and hats, however.

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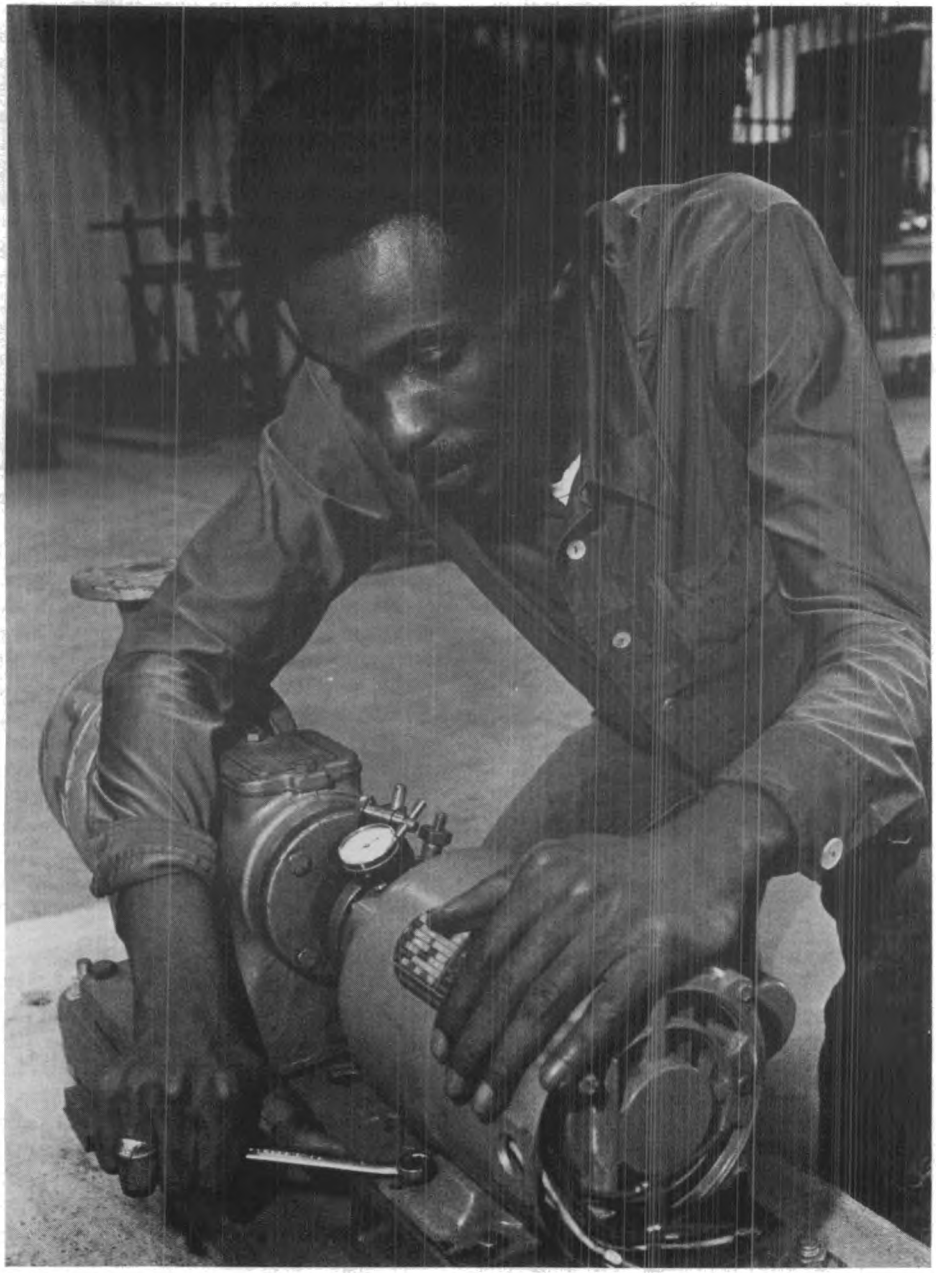

Routine maintenance is just one of the duties of this "jack of all trades".

## Employment

Most of the 91,000 millwrights employed in 1980 worked for manufacturing companies; the majority were in transportation equipment, metal, paper, lumber, and chemical products industries. Others worked for contractors in the construction industry. Machinery manufacturers employed a small number to install equipment in customers' plants.

Millwrights work in every State. However, employment is concentrated in heavily industrialized areas such as Detroit, Pittsburgh, Cleveland, Buffalo, and the Chicago-Gary area.

## Training, Other Qualifications, and Advancement

Most millwrights start as helpers to skilled workers and learn the trade informally on the job. This process can take from 6 to 8 years. Others learn through 4-year formal apprenticeship programs that combine on-the-job training with classroom instruction. Apprenticeship programs include training in dismantling, moving, erecting, and repairing machinery. Apprentices also may work with concrete and receive instruction in related skills such as carpentry, welding, and sheet-metal work. Classroom instruction is given in shop mathematics, blueprint reading, hydraulics, electricity, and safety.

Applicants for apprentice or helper jobs must be at least 17 years old. Most employers prefer applicants with a high school diploma or its equivalent. Courses in science, mathematics, mechanical drawing, and machine shop practice are useful. Because millwrights often take apart complicated machinery, mechanical aptitude is important. Strength and agility also are important, because the work can require a considerable amount of lifting and climbing.

## Job Outlook

Employment of millwrights is expected to increase about as fast as the average for all occupations through the 1980's. Employment will increase as new plants are built, as existing plant layouts are improved, and as increasingly complex machinery is installed and maintained. Besides job openings created by increased demand for millwrights, many openings will arise annually as experienced millwrights transfer to other occupations, retire, or die.

Employment of millwrights is somewhat sensitive to changes in economic conditions. In the construction industry, for example, employment fluctuates with the level of commercial and industrial building activity. When interest rates are high and construction activity falls, jobs are scarce and experienced millwrights may face layoffs or a shortened workweek. They are also subject to seasonal layoffs caused by snow, rain, and other bad weather conditions. Millwrights who work in manufacturing plants, however, usually have more stable employment. They are not subject to seasonal layoffs because they generally work indoors. During poor economic conditions, jobseekers may find fewer opportunities because employers are not installing new equipment. Unlike millwrights in construction, few millwrights in manufacturing are laid off when high interest rates discourage the purchase of new equipment. Existing machinery still needs to be maintained and repaired.

## Earnings

Average hourly earnings of millwrights in metropolitan areas were $10.76 in 1980—about 50 percent higher than the average wage for all nonsupervisory workers in private industry, except farming. Earnings for millwrights in 10 areas that represent various regions of the country appear in table 1.

**Table 1. Average hourly earnings of millwrights in selected areas, 1980**

| Area | Hourly rate |
|---|---|
| Indianapolis | $11.65 |
| Detroit | 11.27 |
| Atlanta | 10.84 |
| Chicago | 10.77 |
| Houston | 10.55 |
| Baltimore | 10.23 |
| St. Louis | 10.09 |
| Cincinnati | 9.77 |
| Minneapolis–St. Paul | 9.57 |
| Boston | 7.72 |

SOURCE: Bureau of Labor Statistics.

Many millwrights belong to labor unions, among which are the International Association of Machinists and Aerospace Workers; United Brotherhood of Carpenters and Joiners of America; United Steelworkers of

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America; International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; United Paperworkers International Union; the International Union of Electrical, Radio and Machine Workers; and the International Brotherhood of Firemen and Oilers.

### Related Occupations

To set up machinery for use in a plant, millwrights must know how to use hoisting devices, and how to assemble, disassemble, and in some cases repair machinery. Other workers with similar job duties are industrial machinery repairers, ironworkers, machine assemblers, and maintenance mechanics.

### Sources of Additional Information

For further information on apprenticeship programs, write to the Apprenticeship Council of your State's labor department, local offices of your State employment service, local firms that employ millwrights, or the Associated General Contractors of America, 1957 E St. NW., Washington, D.C. 20006.

# Piano and Organ Tuners and Repairers

(D.O.T. 730.281-038, .361-010, -014, and 828.261-010)

### Nature of the Work

Whether they are used to perform the classics or contemporary rock, pianos and organs are sources of entertainment and recreation for millions of people. Maintaining the instruments so they perform properly is the job of piano and organ tuners and repairers. There are four different kinds of piano and organ tuners and repairers: Piano tuners, piano techicians, pipe-organ repairers, and electronic-organ technicians.

*Piano tuners* (D.O.T. 730.361-010) adjust piano strings so that they will be in proper pitch. When a piano key is struck, a felt-covered wooden hammer strikes one or more strings, causing them to vibrate. The number of times a string vibrates in a second is called its pitch. For the piano to sound right, all its strings must be set at their proper pitch.

Tuners begin by adjusting the pitch of the "A" or "C" string. Striking the key, the tuner compares the string's pitch to that of a tuning fork. Using a tuning hammer (also called a tuning lever or wrench), the tuner turns a steel pin to tighten or loosen the string until its pitch matches that of the tuning fork. The pitch of all the other strings is set in relation to the "A" or "C" string. The standard 88-key piano has about 230 strings and can be tuned in about an hour and a half.

The sound of the piano also can be affected by problems in the thousands of wooden, steel, iron, ivory, and felt parts in its works. *Piano technicians* (D.O.T. 730.281-038) locate and correct these problems. Technicians also tune pianos.

To get an idea of what is wrong with the piano, technicians talk to the customer. They also may play the instrument or partially dismantle it to inspect the parts. When technicians discover the problem, they make repairs or adjustments. They may realign hammers that do not strike the strings properly. They may replace worn felt or broken strings. They may rebuild or replace the wooden sounding board that amplifies the string's vibrations. Sometimes technicians completely rebuild pianos. To dismantle and repair pianos, technicians use common handtools as well as special ones, such as regulating, repinning, and restringing tools.

Although organs and pianos may look somewhat alike, they work differently, and few tuners and repairers work on both instruments. Moreover, people who service organs specialize in either pipe or electronic organs.

*Pipe-organ repairers* (D.O.T. 730.361-014) tune, repair, and install organs that make music by forcing air through one of two kinds of pipes—flue pipes or reed pipes. The flue pipe sounds when a current of air strikes a metal lip in the side of the pipe. The reed pipe sounds when a current of air vibrates a brass reed inside the pipe.

To tune an organ, repairers first match the pitch of the "A" pipes with that of a tuning fork. The pitch of other pipes is set by comparing it with that of the "A" pipes. To tune a flue pipe, the technician moves the metal slide that increases or decreases the pipe's "speaking length." To tune a reed pipe, the technician alters the length of the brass reed

Piano tuning requires manual dexterity as well as a good ear for pitch.

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inside the pipe. A day or more may be needed to finish one of these jobs, because most organs have hundreds of pipes.

Like piano technicians, pipe-organ repairers must locate and correct problems in the organ's components that affect its sound. This may involve replacing worn parts of the pipes, the console, or other components. Repairers also do maintenance work, such as cleaning the pipes, on a regular schedule.

Occasionally, pipe-organ repairers assemble organs onsite in churches and auditoriums. They follow the designer's blueprints and use a variety of hand and power tools to install and connect the air chest, blowers, air ducts, pipes, and other components. Technicians may work in teams or be assisted by helpers. A job may take several weeks or even months, depending on the size of the organ.

*Electronic-organ technicians* (D.O.T. 828.261-010) have very different duties from pipe-organ repairers, because the sound of electronic organs is synthesized by electronic generators and computer circuits. Most electronic organs do not require tuning. Those that do are fairly simple to tune. However, these organs may break down due to faulty circuits, dirty contacts, and other problems.

To locate the cause of a breakdown, technicians first check for common sources of trouble such as loose connections. When routine checks do not work, technicians refer to wiring diagrams and service manuals that show connections within organs, provide adjustment information, and describe causes of trouble. Circuits that might cause the problem are checked with electronic meters. For example, technicians check voltages until an unusual or irregular measure shows up the part of the circuitry causing trouble. When the cause of the problem is found, technicians make repairs. Often this is done by replacing faulty parts such as circuit boards. In their work, technicians use soldering irons, wire cutters, and other handtools.

## Working Conditions

The work of tuners and repairers is relatively safe, although they may suffer small cuts and bruises when making repairs. Electrical shock is a minor hazard for electronic-organ technicians. Work is performed in shops, homes, and public buildings, such as churches and schools, where working conditions usually are good.

## Employment

About 12,000 persons worked as piano and organ tuners and repairers in 1980; most worked on pianos. About two-thirds of the total worked in repair shops; many are self-employed. Most of the rest worked in music stores or for piano and organ manufacturers.

Piano and organ tuners and repairers are employed mostly in cities and States that have large populations. In towns too small to offer enough work electronic-organ service may be done by television and radio repairers.

## Training, Other Qualifications, and Advancement

Piano tuners and technicians and pipe-organ repairers generally learn their trade on the job. Some music stores, large repair shops, and self-employed technicians hire inexperienced people as trainees. Trainees do general cleanup work, help move and install instruments, and do other routine tasks. Trainees tune and repair instruments under the supervision of experienced workers. Usually 4 to 5 years of training and practice work are needed to become a competent piano technician or pipe-organ repairer.

A small number of technical schools and colleges offer courses in piano technology that last 6 months to 2 years. Home study (correspondence school) courses in piano technology also are available. These courses emphasize practice tuning and piano repair. Graduates of these courses generally are encouraged to refine their skills by working for a time with an experienced tuner or technician. Employers generally prefer to hire workers with some knowledge of the trade.

Formal training or work experience in electronics is needed to learn electronic organ repair. Training in electronics is available from private vocational schools, community colleges, some high schools, and the Armed Forces. People with electronics training usually learn to repair organs on the job working in music stores or in repair shops. Technicians who are employed by music stores can attend classes run by organ manufacturers to provide information on servicing their instruments.

Employers prefer high school graduates for beginning jobs in piano or organ servicing. Music courses help develop the student's ear for tonal quality. Courses in woodworking also are useful because many of the moving parts in pianos and pipe organs are made of wood.

People interested in a career in these fields should have good hearing, mechanical aptitude, stamina, and manual dexterity. Because work frequently is done in the customer's home, a neat appearance and a pleasant, cooperative manner also are important. Ability to play the instrument helps but is not essential as a qualification.

Piano and organ tuners and repairers keep up with new developments in their fields by studying trade magazines and manufacturers' service manuals. The Piano Technicians Guild helps its members improve their skills through training programs conducted at local chapter meetings and at regional and national seminars. Guild members also can take a series of tests to earn the title Registered Tuner-Technician. The title is an acknowledgment of the technician's skills.

Tuners and repairers who work for large dealers or repair shops can advance to supervisory positions. Most people in this field, however, go into business for themselves. Opening a repair business is fairly easy because only a small investment in tools is required. Basic piano or pipe-organ tools cost only a few hundred dollars; tools and test equipment for electronic organs may cost about a thousand dollars. However, the tuning and repair business is very competitive. People without adequate training often fail to attract enough customers to stay in business. Self-employed tuners and repairers operate out of their own homes and use either a car or a small truck for service calls. They also may work another job until their clientele is large enough to support a repair business.

## Job Outlook

Little or no change in employment of piano and organ tuners and repairers is expected through the 1980's. Job openings will become available each year as experienced workers retire, die, or transfer to other occupations. However, this is a very small occupation, and the number of job openings will be few.

Millions of pianos and organs already are in use and the number will increase as the population grows and as people get more leisure time. The large number of instruments in use will assure a demand for tuning and repair work. However, opportunities for untrained workers in these occupations are few. Most music store owners and self-employed tuners and repairers are reluctant to train persons who do not have at least a basic understanding of piano and organ tuning and repair. Training such people requires time that could be more profitably spent doing tuning or repair work. Individuals with some familiarity of the trade may find it easier to get a trainee job.

Because piano and organ tuning and repair are a luxury for most consumers, these occupations are sensitive to the downturns in the economy. During poor economic conditions, tuners and repairers may lose income because their customers put off tuning and repairing instruments. People wishing to enter the trade usually find music store owners and self-employed tuners and technicians especially reluctant to hire trainees when business is slow.

## Earnings

Experienced workers earned from $5 to $10 an hour in 1980, according to the limited information available. Wages vary with the skill of workers and the area of the country. Wage rates for helpers ranged from $3 to $5 an hour. Some helpers receive no pay; they work for the training.

Self-employed tuners and repairers earned from $12,000 to $14,000 a year in 1980. Earnings of the self-employed depend on the size of the community, their ability to attract and keep customers, their operating expenses, and the amount of competition from other tuners and repairers.

During fall and winter, people spend more time indoors playing their pianos or organs. Consequently, many tuners and repairers work more than 40 hours a week at that time. Self-employed tuners and repairers frequently work evenings and weekends to suit their customers.

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## Related Occupations

There are almost as many different musical-instrument repairers as there are different musical instruments. Other occupations in this trade are accordion repairer, fretted-instrument repairer, harpsichord repairer, violin repairer, wind-instrument repairer, accordion tuner, percussion-instrument repairer, percussion tuner, and bow repairer.

## Sources of Additional Information

Details about job opportunities may be available from local piano and organ dealers and repair shops. For general information about piano technicians and a list of schools offering courses in piano technology, write to:

Piano Technicians Guild, 113 Dexter Ave. N., Seattle, Wash. 98109.

# Pinsetter Mechanics

(D.O.T. 638.261-022)

## Nature of the Work

An important piece of machinery in the modern bowling center is the automatic pinsetter. It returns the ball to the bowler, clears the fallen pins from the lane, and resets pins for the next ball. When this complex machine fails to work properly, the game is held up and the bowling center's customers are inconvenienced. Keeping pinsetters running properly is the job of pinsetter mechanics.

Pinsetters have many electrical and mechanical parts that require regular service to operate correctly. Pinsetters must be cleaned, gears and other moving parts must be lubricated, and motors must be adjusted. Mechanics perform these jobs according to a schedule recommended by the pinsetter's manufacturer. They also inspect the machines for faulty parts and wiring that may cause breakdowns.

When a pinsetter malfunctions, mechanics must find the cause of the trouble and make repairs. To locate the problem, mechanics may refer to troubleshooting manuals and diagrams of electrical circuits. Often they can find the trouble relying only on the knowledge of the machine that they have gained through experience. To fix the pinsetter, mechanics repair, replace, or adjust broken mechanical or electrical parts, such as gears, bearings, and motors.

Mechanics use many different types of tools, such as wrenches, screwdrivers, soldering irons, portable hoists, and lubricating equipment, to repair and service the parts. They occasionally use ohmmeters, voltmeters, and other devices to test electrical circuits, relays, transformers, and motors.

Mechanics often supervise one or more assistant mechanics or pinchasers. Mechanics train these workers to correct minor problems, such as jammed pins and balls, by explaining how the machine operates and by demonstrating how to make repairs. Assistant mechanics or the pinchasers maintain the pinsetters when the mechanic is off duty.

Pinsetter mechanics must have a working knowledge of electricity and electronics.

In some bowling centers, mechanics perform other maintenance, such as conditioning lanes, cleaning and maintaining pins, and repairing seats and tables. Mechanics do some clerical work, maintaining an inventory of parts. They also may keep records of pinsetter malfunctions and estimate maintenance costs.

## Working Conditions

Mechanics frequently work in the long, relatively narrow corridor at the end of bowling lanes where the automatic pinsetters are located. In many bowling centers there also is a larger work room where mechanics do repairs and keep supplies and tools. The work area usually is well lighted and well ventilated but quite noisy when the machines are operating. When making repairs and adjustments, mechanics frequently have to climb and balance on the work platform of the pinsetter and to stoop, kneel, crouch, and crawl around the machines. Those who install and service machines for manufacturers must travel to the various bowling centers in their area. The job generally is not dangerous but workers are subject to common shop hazards, such as cuts, falls, bruises, and electrical shock.

## Employment

About 6,500 pinsetter mechanics were employed in 1980. Almost all worked in bowling centers. A small number were employed by manufacturers of automatic pinsetters to install machines and service those in bowl-

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ing centers that did not employ full-time mechanics.

Pinsetter mechanics are employed in every State, but employment is concentrated in heavily populated areas, where there are many bowling centers.

## Training, Other Qualifications, and Advancement

Generally, there are no education or experience requirements for a job as a pinsetter mechanic. Some employers, however, prefer to hire applicants who are high school graduates and who have completed courses in electricity, machine repair, blueprint reading, and shop math. Employers also prefer applicants who have experience repairing some type of machinery.

Pinsetter mechanics usually begin work as assistant mechanics and train on the job. Trainees learn about the pinsetter's operation and maintenane by observing head mechanics and working on the machines under their supervision. Trainees are taught how to lubricate and clean pinsetters and to perform other preventive maintenance. Trainees also learn to diagnose and repair various kinds of machine breakdowns. Usually, 1 to 2 years of on-the-job training and experience are needed to acquire mechanics' skills.

Some mechanic trainees are sent to training courses conducted by pinsetter manufacturers. These are open only to mechanics who work at a bowling center, however. The bowling center usually pays the tuition.

The manufacturers' courses, which last 2 to 4 weeks, include classroom lectures and shopwork with demonstration machines. Trainees study the structure and operation of machines made by the firm operating the school and learn to locate typical sources of trouble. They learn to perform preventive maintenance, to read wiring diagrams, and to use the tools of the trade.

People who want to become a bowling-pin-machine mechanic should have mechanical ability and like to work with their hands. They also should have good eyesight (including normal color vision), good eye-hand coordination, and average physical strength.

Advancement opportunities for pinsetter mechanics are limited. Mechanics who work for large establishments such as bowling center chains or for pinsetter manufacturers may advance to maintenance supervisor. Some mechanics become assistant managers or managers of bowling establishments.

## Job Outlook

Little or no change is expected in employment of pinsetter mechanics through the 1980's. The demand for bowling facilities is likely to grow as the population increases. However, the growth in these facilities will be slowed by the high costs associated with the construction of new bowling centers. Most job openings will arise from the need to replace experienced mechanics who retire, die, or leave the occupation for other reasons. Because this occupation is very small, only a limited number of jobs will become available.

Pinsetter mechanics generally do not lose their jobs during a recession. Although bowling centers may lose some business during hard times, mechanics still are needed to maintain and repair the equipment. In addition, employers generally are reluctant to lay off skilled mechanics, because they may get jobs in other bowling centers.

## Earnings

Hourly earnings in 1980 ranged from $4 for mechanic trainees up to $10.50 for head mechanics, according to the limited information available. Wages vary greatly by area and with the experience of the mechanic.

## Related Occupations

The smooth operation of a bowling center depends on the ability of the pinsetter mechanic to keep both the electrical and the mechanical parts of the pinsetter operating normally. Other mechanics who need knowledge of both electrical and mechanical repair work include bakery machine mechanics, laundry machine mechanics, maintenance mechanics, sewing-machine mechanics, and vending-machine mechanics.

## Sources of Additional Information

People who want further information about work opportunities in this occupation should contact bowling centers in their area or the local bowling proprietors' association. The local office of the State employment service is another source of information about employment and training opportunities.

# Vending Machine Mechanics

(D.O.T. 639.281-014)

## Nature of the Work

Vending machines have become a familiar part of everyday life. In places of recreation, work, and education, vending machines provide all types of refreshments, from a piece of candy to a complete meal. Vending machine mechanics keep these machines in good working order.

Before new machines are placed on location for use, mechanics make sure they operate correctly. When checking complicated electrical and electronic machines, such as beverage dispensers, they make sure that the machines mix drinks properly and that refrigerating and heating units work correctly. On the relatively simple gravity-operated machines, mechanics check handles, springs, plungers, and merchandise chutes. They also test coin and change-making mechanisms. When installing machines on location, mechanics make the necessary water and electrical connections and recheck the machines for proper operation.

If a machine breaks down, mechanics must determine the cause of the trouble. They first inspect the machine for obvious problems, such as loose electrical wires, malfunctions of the coin mechanism, and leaks. If the problem cannot be readily located, they may refer to troubleshooting manuals and wiring diagrams and use testing devices such as electrical circuit testers to find defective parts. Mechanics may repair faulty parts at the site. However, they often install replacements and take broken parts to the company shop for repair.

Preventive maintenance—avoiding trouble before it starts—is another major part of the job. For example, mechanics periodically clean electrical contact points, lubricate mechanical parts, and adjust machines to perform properly.

In repair and maintenance work, mechanics use pipe cutters, soldering irons, wrenches, screwdrivers, hammers, and other handtools. In the repair shop, they may use power tools, such as grinding wheels, saws, and drills.

Because vending machines dispense food, mechanics must know State public health and sanitation standards as well as those established under local plumbing codes. They also must know and follow safety procedures, especially when lifting heavy objects and working with electricity and gas.

Mechanics must do some clerical work, such as filing reports, preparing repair cost estimates, and ordering parts. Those employed by small operating companies may service as well as repair machines. These combination "mechanic-routeworkers" stock machines, collect money, fill coin and currency changers, and keep daily records of merchandise distributed.

## Working Conditions

Some mechanics work in company repair shops, others work in the field, but many do both. Those who work in the field drive a service truck between locations. Since vending machines can be operated around the clock, mechanics sometimes work at night and on weekends and holidays.

Vending machine repair shops generally are quiet, well lighted, and have adequate work space. However, when servicing machines on location, mechanics may work in cramped quarters, such as passageways, where pedestrian traffic is heavy. Repair work is relatively safe, although mechanics are subject to hazards such as electrical shocks and cuts from sharp tools and metal objects.

## Employment

In 1980, about 13,500 mechanics maintained and repaired about 5 million vending machines. Most mechanics work for vending companies that sell food and other items through machines. Some work for soft drink bottling companies that have their own coin-operated machines. Other mechanics, who are employed as instructors by machine man-

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ufacturers, teach vending company mechanics to repair new machines. Although mechanics are employed throughout the country, most are located in areas with large populations where there are many vending machines.

## Training, Other Qualifications, and Advancement

Persons often enter this trade as general shop helpers or route drivers. Most new workers learn the trade informally on the job by observing, working with, and receiving instruction from experienced mechanics. Trainees usually start out by doing simple jobs such as cleaning, painting, or refurbishing machines. From there, they learn to rebuild machines—removing defective parts, repairing, adjusting, and testing the machines. Next, they accompany an experienced mechanic on service calls, and then go out on their own. They call upon the expertise of other mechanics, when necessary. At this point they have completed their on-the-job training. This process takes from 6 months to 3 years, depending on the individual's abilities, previous education, and the quality of instruction.

Many beginners are high school graduates, but employers may not require a diploma. High school or vocational school courses in electricity, refrigeration, and machine repair help beginners to qualify for entry jobs. There are about 10 high schools and junior colleges in the country offering 1- to 2-year training programs for vending machine mechanics.

The National Automatic Merchandising Association has established an apprenticeship program to help employers train new workers. Apprentices are guaranteed periods of training in various skills. The program also calls for 144 hours of related instruction each year in subjects such as basic electricity, blueprint reading, customer relations, and safety. Apprenticeships last 3 years. The NAMA program includes certification of mechanics upon completion of their on-the-job training, and passing performance and written tests.

To learn about new machines, mechanics sometimes attend manufacturer-sponsored training sessions in repair shops, or in manufacturers' service facilities. Employers usually pay wages and expenses during these sessions, which may last from a few days to several weeks.

Some employers encourage both trainees and experienced mechanics to take evening courses in subjects related to vending machine operation and repair—for example, basic electricity and refrigeration. Employers often pay for at least part of the tuition and book expenses for these courses.

Employers require applicants for mechanic jobs to demonstrate mechanical ability, either through their work experience or by scoring well on mechanical aptitude tests. Since mechanics are exposed to thousands of dollars in merchandise and cash, employers prefer applicants who have a record of honesty and respect for the law. The ability to deal tactfully with people also is important. A commercial driver's license and a good driving record are essential for most vending mechanic jobs.

Vending machine mechanics often start as shop helpers and learn on the job.

Skilled mechanics may be promoted to supervisory jobs. Some open their own vending companies.

## Job Outlook

Employment of vending machine mechanics is expected to grow more slowly than the average for all occupations through the 1980's. More vending machines will be installed as demand for fast food service grows and as more industrial plants, hospitals, and stores move to suburban areas where restaurants are not always close by. In addition, vending companies will increase the variety of products sold through the machines. Growth in the number of vending machines will create more jobs for mechanics. Job openings also will arise as experienced mechanics retire, die, or transfer to other occupations.

Persons with training or previous experience in vending machine repair should be able to find jobs easily. Persons with some background in electronics should have excellent job prospects, as more electronic components are used in vending machines. Job prospects for workers without experience or vocational training often depend on local economic conditions. For example, if vending company operators need more mechanics and cannot find trained or experienced ones, they are likely to promote qualified route drivers or hire inexperienced people who have acquired mechanical aptitude by taking high school courses in shop and electricity.

During economic downturns, employers are unlikely to lay off experienced mechanics because of concern that they would not be available for rehire when business improves.

## Earnings

Wage rates for vending machine mechanics ranged from $5 to $12 an hour in 1980. Apprentices start at 50 percent of the rate paid experienced mechanics and receive increases every 6 months.

Most vending machine mechanics work 8 hours a day, 5 days a week, and receive premium pay for overtime. Some union contracts stipulate higher pay for nightwork and for emergency repair jobs on weekends and holidays.

Many vending machine mechanics employed by large companies are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America.

## Related Occupations

Other workers who repair equipment with electrical and mechanical components include bowling-pin-machine mechanics, electrical-appliance servicers, laundry machine mechanics, maintenance mechanics, business machine repairers, and sewing machine mechanics.

## Sources of Additional Information

Further information on job opportunities can be obtained from local vending machine firms and local offices of the State employment or apprenticehsip service. For general information on vending machine mechanics, as well as a list of schools offering courses in vending machine mechanics, write to:

National Automatic Merchandising Association, 7 S. Dearborn St., Chicago, Ill. 60603.

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# Watch Repairers

(D.O.T. 715.281-010, -014)

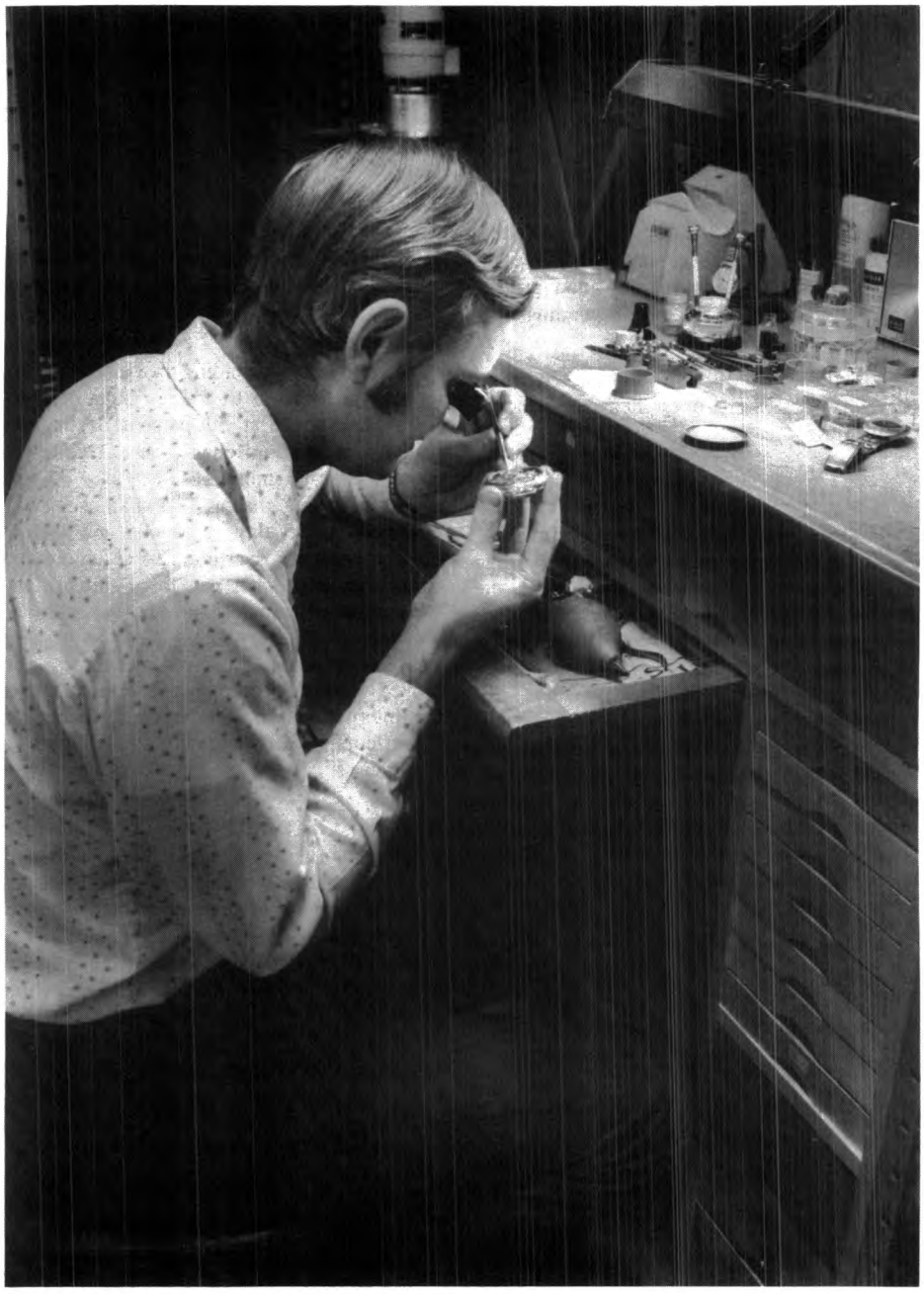
## Nature of the Work

Whether they use a grandparent's pendant or pocket model, or a multifunction digital, people depend on watches to keep on schedule. Keeping these timekeeping devices operating properly is the job of watch repairers. These workers clean, repair, and adjust the many types of watches and clocks now in use.

Many watches operate mechanically; a mainspring supplies the power and wheels and gears regulate the movement of the hands. When a mechanical watch is not working properly, repairers use tweezers, screwdrivers, and other tools to remove the watch movement—the mainspring, wheels, and gears—from the case. Repairers clean the movement in an ultrasonic cleaner. If the watch still does not work, they carefully disassemble the movement to find broken, worn, or improperly adjusted parts. When working with these small parts, watch repairers wear magnifying glasses and sometimes microscopes. They may replace the mainspring and other parts of the winding mechanism, adjust or replace improperly fitted wheels and gears, or replace broken parts. Repairers then inspect and check all the parts as they reassemble the movement. When the movement is reassembled, repairers test the watch's accuracy with a timing machine.

Over the past two decades, several types of electronic watches have been marketed. Batteries supply the power, and tuning forks, quartz crystals, and microprocessors regulate the time. Some electronic watches have hands, gears, and wheels but, others, such as digitals, have no moving parts. To repair electronic watches, repairers check circuits with electrical test equipment. The meters show which parts of the watch are malfunctioning and have to be replaced. Repairers also replace batteries.

Watch repairers who own jewelry stores may repair jewelry and sell watches, jewelry, silverware, and other items. They also may hire and supervise salesclerks, other watch repairers, and jewelers; arrange window displays; purchase goods to be sold; and perform other managerial duties.



Many watch repairers have their own business.

## Working Conditions

The work of watch repairers involves little physical exertion and generally is performed in comfortable surroundings. However, the patience and concentration required to work with small parts can cause stress.

Watch repairers have more freedom than other workers in determining their work setting and hours. Some watch repairers, for example, work part time out of their homes.

## Employment

About 12,000 persons worked as watch repairers in 1980. About two-fifths were self-employed. Most watch repairers worked in jewelry stores or repair shops, which are located throughout the country. A small number had jobs in factories that make watches, clocks, or other precision timing instruments.

## Training, Other Qualifications, and Advancement

Most people learn the trade in watch repair schools. There are no educational requirements for entrance into watch repair schools, although most students are high school graduates. Some schools test a student's mechanical aptitude and manual dexterity. Most schools charge tuition and require students to furnish their own handtools. Courses last from 1 to 3 years for full-time students. Students learn to use and care for the watch repairer's tools and machines, make and adjust individual parts, take apart and reassemble various kinds of watches and clocks and diagnose and solve repair problems. Some schools offer courses in repairing unusual types of timepieces, such as chronographs and antique watches. Graduates often find it advantageous to work with an experienced watch repairer for several years to improve their skills and knowledge of business operations.

Watch repair also can be learned through on-the-job arrangements with experienced workers. However, few shop or store owners hire inexperienced workers, because of the time required for supervision. This type of training is less structured than classroom in-

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struction. Trainees learn by observing experienced repairers and by performing simple and then more complex repairs.

The following States require watch repairers to obtain a license: Indiana, Iowa, Kentucky, Louisiana, Michigan, Minnesota, and North Dakota. To obtain a license, repairers must pass an examination designed to test their skill with tools and their knowledge of watch construction and repair.

Watch repairers in all States can demonstrate their competence by passing certification examinations given by the American Watchmakers Institute. Tests are given for the titles: Certified Watchmaker, Certified Electronic Watch Specialists, Certified Master Watchmaker, Certified Clockmaker, and Certified Master Clockmaker. Annual voluntary examinations covering new phases of watchmaking also are offered.

A person planning a career as a watch repairer must be willing to sit for long periods and work with a minimum of supervision. The precise and delicate nature of the work requires patience and concentration. Because a watch is simply a small machine, mechanical aptitude is essential. Good depth perception and eye-hand coordination are necessary in working with the tiny parts.

Watch repairers who have sufficient experience and funds may open their own repair shops. Watch repairers also may open their own jewelry stores, where they can increase their income by selling watches and other merchandise in addition to repairing watches. Jewelry stores require a much greater financial investment than repair shops, because an inventory of expensive merchandise must be obtained.

## Job Outlook

Employment of watch repairers is expected to increase more slowly than the average for all occupations through the 1980's. However, due to the need to replace experienced repairers who retire, die, or leave the occupation for other reasons, job opportunities should be very good for trained watch repairers.

More watches will be sold as population and incomes rise, but many will cost little more to replace than to repair. Consequently, employment of repairers is not expected to keep pace with sales of watches. However, so many watches are in use that the need for watch repairers should remain strong. In recent years, job openings have exceeded the number of trained workers entering the occupation. If this gap continues, trained workers should find jobs readily available. Opportunities are expected to be particularly good for workers who can repair the increasingly popular electronic watches.

## Earnings

Based on the limited information available, watch repairers in entry jobs generally earned from about $150 to $250 a week in 1980. Experienced watch repairers working in retail stores and repair shops earned from $250 to $500 a week. Some watch repairers may be paid a commission based on the number of watches repaired. Others rent space in a jewelry store, set up a repair department, and split the profits with the store owner. Watch repairers who are paid a commission or who own their own businesses can earn considerably more than those working for a salary.

## Related Occupations

Watch repairers do detailed work with small parts. Other workers that need similar manual skill include engravers, gunsmiths, hand carvers, hand painters, jewelers, model makers, and taxidermists.

## Sources of Additional Information

For information about training courses and watch repairing as a career, contact:

American Watchmakers Institute, 3700 Harrison Ave., Cincinnati, Ohio 45211.

For information about job opportunities in retail stores, contact:

Jewelers of America, Inc., Time-Life Building, 1271 Avenue of the Americas, Suite 650, New York, N.Y. 10020.

Further information about work opportunities or training in this trade also is available from local offices of the State employment service.

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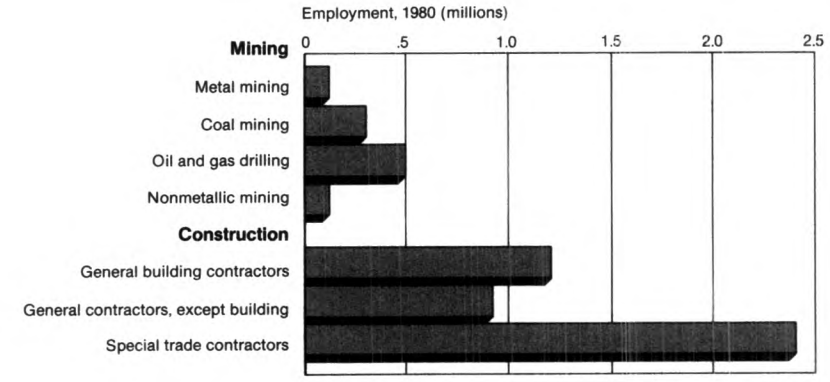
# Construction and Extractive Occupations

Construction and extractive workers make up two of the most important groups of occupations in the Nation's labor force. Construction workers build the houses that shelter the population and construct the factories in which the Nation's goods are produced. Extractive workers mine the fuels and raw materials needed in all industries.

Construction, mining, and oil and gas drilling are complex operations that require workers with many kinds of skills. Construction and extractive workers accomplish their tasks using tools, machinery, and materials that frequently are peculiar to their occupation. Brickmasons work with mortar, trowels, and brick. Blasters shatter ores and stone with explosives. Although construction and extractive workers use laborsaving machinery and tools, the work in most of these occupations is physically demanding.

**Oil and gas drilling and special trade contractors account for more than half of all workers in mining and construction**




Source: Bureau of Labor Statistics

Workers in the construction and extractive occupations usually acquire their skills through on-the-job training. Although many employers prefer to hire high school graduates, physical strength, stamina, and mechanical aptitude often are as important as an applicant's level of education. New workers learn by doing the job under the supervision of experienced workers. For some occupations, new workers also receive classroom instruction in related topics. Electricians, for example, learn electrical theory, mathematics, and blueprint reading, and coal miners take safety classes. The type and length of training vary among the occupations. Union-management contracts frequently set the rules governing opportunities for training and entry into the construction and extractive occupations. Many construction workers, for example, learn their trades through apprenticeships administered by union-management committees.

The occupational statements in this chapter describe in detail the work, training, and job outlook for 16 construction and extractive occupations.

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# Construction Occupations

Construction craft workers represent the largest group of skilled workers in the Nation's labor force. The construction trades offer especially good opportunities for young people who are not planning to go to college, but who are willing to spend several years learning a skilled occupation. Construction workers can find job opportunities in all parts of the country. Their hourly wage rates generally are much higher than those of most other manual workers. Construction trade workers with business ability have greater opportunities to open their own businesses than workers in most other skilled occupations.

## What are the Construction Trades?

Workers in the construction trades build, repair, and modernize homes and all kinds of buildings. They also work on a variety of other projects including airports, mass transportation systems, and recreation facilities.

Construction work may be divided into three categories: Structural, finishing, and mechanical. In general, each construction worker falls in one of these categories: *Structural workers*: Bricklayer, carpenter, cement mason, iron worker, operating engineer (construction machinery operator), stonemason, and boilermaker. *Finishing workers*: Floor covering installer, glazier, insulation worker, lather, painter, paperhanger, plasterer, roofer, and terrazzo worker. *Mechanical workers*: Construction electrician, elevator constructor, pipefitter, plumber, sheet-metal worker, and millwright.

Most construction trades are described individually later in this section. Boilermakers and millwrights are described elsewhere in the *Handbook*.

## Working Conditions

Construction work frequently requires prolonged standing, bending, stooping, and working in cramped quarters. Exposure to weather is common since much of the work is done outdoors or in partially enclosed structures. Many people prefer construction work because it permits them to be outdoors.

Construction workers may need to work with sharp tools, amidst a clutter of materials. In addition, they often stand on temporary scaffolding. As a result, they are more prone to injuries than workers in other jobs. Indeed, the construction industry has the highest injury and illness rate of all industries. However, employers increasingly are emphasizing safe working conditions and stressing safe work habits—practices that reduce the risk of injuries. "Hard hats," steel-toed shoes, safety belts, and nets are some of the devices that help reduce risk.

## Employment

About 4 million persons worked in construction trades in 1980. The accompanying table shows employment in some of the largest construction occupations.

**Table 1. Employment in selected construction occupations, 1980**

| Occupation | Employment |
|---|---|
| Carpenter | 970,000 |
| Electrician (construction and maintenance) | 560,000 |
| Plumber and pipefitter | 407,000 |
| Painter, construction and maintenance | 382,000 |
| Brickmason | 146,000 |
| Concrete and terrazzo finisher | 113,000 |
| Roofer | 113,000 |
| Drywall installer and finisher | 84,000 |
| Drywall applicator | 52,000 |
| Taper | 32,000 |
| Structural steel worker | 75,000 |
| Carpet cutter and layer | 53,000 |
| Asbestos and insulation worker | 45,000 |
| Reinforcing ironworker | 34,000 |
| Glazier (construction) | 14,000 |

SOURCE: Bureau of Labor Statistics

Most construction workers are employed by contractors in the construction industry. The vast majority of construction contractors are small—generally employing fewer than 10 people. A few large contractors, however, employ thousands. Large numbers of construction trade workers are employed in other industries, such as mining and manufacturing, mainly to do maintenance and repair work. Chemical manufacturers, for example, need plumbers and pipefitters to maintain the complex pipe networks in their processing plants. Government agencies employ construction trade workers to maintain highways, buildings, and sanitation systems.

About 1 out of 5 construction craft workers is self-employed and contracts with homeowners and businesses for small jobs. Self-employment is most common in paperhanging, painting, and floor covering work, but it also is found in other trades.

Part-time workers, who make up a significant part of the construction work force, account for about 1 out of every 6 workers, according to limited information.

Employment in the construction trades is distributed geographically in much the same way as the Nation's population. Thus, construction workers are concentrated in industrialized and highly populated areas.

## Training, Other Qualifications, and Advancement

Most training authorities recommend formal apprenticeship training as the best way to acquire the all-round skills of the construction trades. Apprenticeship is a prescribed period of on-the-job training, supplemented by related classroom instruction that is designed to familiarize apprentices with the materials, tools, and principles of their trade. Formal apprenticeship agreements are registered with a State apprenticeship agency or the U.S. Department of Labor's Bureau of Apprenticeship and Training.

Although apprenticeship provides the most thorough training, many people acquire construction skills informally by working as laborers and helpers and observing experienced craft workers. Some acquire skills by attending vocational or trade schools or by taking correspondence school courses.

Apprentices generally must be at least 18 years old and in good physical condition. A high school or vocational school education or its equivalent, including courses in mathematics and mechanical drawing, is desirable. Courses in construction trades, such as carpentry and electricity, also are recommended. Often, applicants are given tests to determine their aptitudes.

The formal apprenticeship agreement generally calls for 3 to 4 years of on-the-job training and 144 hours or more of related classroom instruction each year. On the job, most instruction is given by a particular craft worker to whom the apprentice is assigned.

Classroom instruction varies among construction trades, but usually includes courses such as history of the trade, characteristics of materials, shop mathematics, and basic construction principles.

In most communities, apprenticeship programs are supervised by joint apprenticeship committees composed of local employers and local union representatives. The committee determines the need for apprentices in the community and establishes minimum standards of education, experience, and training. Whenever an employer cannot provide all-round instruction or relatively continuous employment, the committee transfers the apprentice to another employer. Where specialization by contractors is extensive—for instance, in electrical work—customarily the committee rotates apprentices among several contractors at intervals of about 6 months.

In areas where these committees have not been established, the apprenticeship agreement is solely between the apprentice and the employer or employer group. Many people have received valuable training under these programs, but they have some disadvantages. No committee is available to supervise the training offered and settle differences over the terms and conditions of training. What the apprentice learns depends largely on the



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employer's business prospects and policies. If the employer lacks continuous work or does only a restricted type of work, the apprentice may find it difficult to develop all-round skills.

In many localities, craft workers—most commonly electricians and plumbers—are required to have a license. To qualify for these licenses, they must pass an examination to demonstrate a broad knowledge of the job and of State and local regulations.

Since construction requires a team effort, the ability to work well with supervisors, peers, and subordinates is vital. Manual dexterity is necessary to work quickly and accurately with trowels, hammers, chisels, saws, drills, and other tools and machinery. The ability to solve mechanical and structural problems is important to many highly skilled construction workers. With guidelines from an architect, for example, a plumber might have to plan the layout of a plumbing system or a particular room to make the best use of limited materials and space. Precision, an eye for detail, the ability to picture objects from blueprints, and color discrimination also are vital in many construction trades.

Construction craft workers may advance in a number of ways. Many become supervisors. In most localities, small jobs are run by 'working supervisors'' who work along with members of their crews. On larger jobs, the supervisors do only supervisory work. Craft workers also can become estimators for contractors. In these jobs, they estimate material requirements and labor costs to enable the contractor to bid on a particular project. Some craft workers advance to jobs as superintendents on large projects. Others become instructors in trade and vocational schools or sales representatives for building supply companies. A large number of craft workers have become contractors in the homebuilding field.

Starting a small contract construction business is easier than starting a small business in any other industries. Only a moderate financial investment usually is needed to conduct a substantial business from one's home. However, the field is very competitive, and the rate of business failure is high among small contractors.

## Job Outlook

Employment in the construction trades is expected to increase about as fast as the average for all occupations through the 1980's. In addition to jobs arising from growth in construction, many job openings will result each year from the need to replace experienced workers who retire, die, or leave their jobs for other reasons. However, since construction is sensitive to changes in the Nation's economy, employment may fluctuate from year to year. Contruction trade workers can experience periods of unemployment during downturns in construction activity.

Over the long run, construction activity is expected to grow substantially. The anticipated increases in population and households are expected to create pressure for new housing. Migration to the South and West may create particularly strong pressure in those regions for housing as well as hospitals, schools, recreation facilities, and other structures. Among other factors that will stimulate contruction activity are higher levels of personal income and a rise in spending for new industrial plants and equipment. Additional money will be spent to build and renovate mass transit systems and to develop and construct powerplants. Also, there will be a growing demand for alteration and modernization of existing structures, as well as for maintenance and repair on highway systems, dams, bridges, and similar projects.

The increase in employment is not expected to be as great as the expansion in construction activity. Continued technological developments in construction methods, tools and equipment, and materials will raise output per worker. One important development is the growing use of prefabricated units at the job site. For example, preassembled outside walls and partitions can be lifted into place in one operation.

The rates of employment growth will differ among the various construction trades. Growth is expected to be relatively fast for bricklayers and cement masons, and relatively slow for painters and paperhangers.

## Earnings

According to a 1980 survey of cities with at least 100,000 inhabitants, the average hourly union wage rate for all construction trades was $12.21. The hourly wage rate for all nonsupervisory and production workers in private industry, except farming, averaged $6.66. Wage rates for apprentices and other trainees usually start at 50 percent of the rate paid to experienced workers and increase at 6-month to 1-year intervals until the full rates are achieved upon the completion of training. The accompanying table shows union hourly averages for selected construction trades in 1980.

**Table 2. Average hourly union wage rates for selected construction occupations, 1980**

| Occupation | Hourly rate |
|---|---|
| Pipefitter | $13.54 |
| Electrician | 13.46 |
| Elevator constructor | 13.06 |
| Structural ironworker | 12.73 |
| Bricklayer | 12.64 |
| Asbestos worker | 12.59 |
| Carpenter | 12.42 |
| Cement finisher | 12.16 |
| Roofer, composition | 12.08 |
| Painter | 12.00 |
| Roofer, slate and tile | 11.70 |

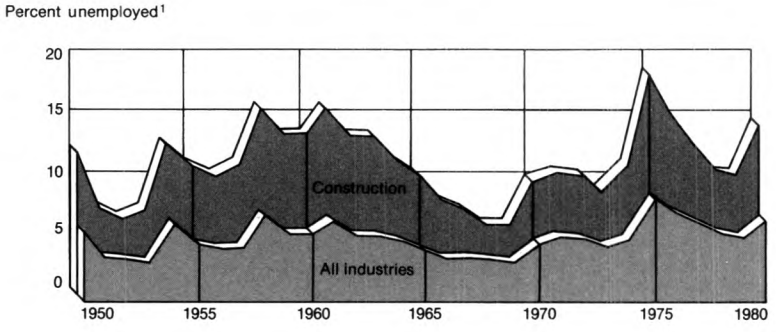
SOURCE: Bureau of Labor Statistics.

Wage rates generally were highest in the West and lowest in the South. Except for a few trades, such as electricians, elevator constructors, and plumbers and pipefitters, yearly earnings for experienced workers and their apprentices generally are lower than hourly rates would indicate because poor weather and fluctuations in construction activity may adversely affect the number of hours they can work a year.

Traditionally, winter is the slack period for construction activity, particularly in colder regions. Some workers, such as laborers and roofers, may not work for several months. However, not only cold but also rain may slow—even stop—work on a construction project. Also, because construction trades depend on one another—particularly on large projects—work delays or strikes in one trade can delay or stop the work of another. The accompanying chart shows that the unemployment rate in the construction industry is about twice that in the Nation as a whole.

A large proportion of construction workers

**The unemployment rate in construction generally is more than twice that in all industries combined**




[1]Unemployment rates for wage and salary workers
Source: Bureau of Labor Statistics

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are members of trade unions affiliated with the Building and Construction Trades Department of the AFL-CIO.

### Sources of Additional Information

Information about opportunities for apprenticeship or other training can be obtained from local construction firms and employer associations, the local office of the State employment service or State apprenticeship agency, or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. Many apprenticeship programs are supervised by local union-management committees. In these instances, an apprentice applicant may apply directly to the coordinator of the committee.

For additional information on jobs in the construction trades, contact:

AFL-CIO, Building and Construction Trades Department, 815 16th St. NW., Washington, D.C. 20006.

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

National Association of Home Builders, 15th and M Sts. NW., Washington, D.C. 20005.

For the names of labor organizations and trade associations concerned with specific trades, see the discussions of individual building trades that follow.

## Bricklayers and Stonemasons

(D.O.T. 861.361-010, -014, .381-010, -014, -018, -022, -026, -030, -038, -042, .684-010, and -014)

### Nature of the Work

Bricklayers and stonemasons work in closely related trades, each producing attractive, durable surfaces. Bricklayers build walls, partitions, fireplaces, and other structures with brick, cinder block, and other masonry materials. They also install firebrick linings in industrial furnaces.

Stonemasons build stone walls as well as set stone exteriors and floors. They work with two types of stone—natural cut, such as marble, granite, and limestone; and artificial stone made from cement, marble chips, or other masonry materials. Because stone is expensive, stonemasons work mostly on high-cost buildings, such as offices, hotels, and churches.

In putting up a wall, bricklayers use plumblines and a level to build the corners. They then stretch a line from corner to corner to guide each course or layer of brick. Bricklayers spread a bed of mortar (cement mixture) with a trowel (a flat metal tool), place the brick on the mortar bed, and then tap it into place. As blueprints specify, they cut bricks with a hammer and chisel to fit around windows, doors, and other openings. Mortar joints are finished with jointing tools to leave a neat and uniform appearance. Bricklayers also may use steel supports at window and door openings.

Bricklayers are assisted by hod carriers, or helpers, who supply bricks and other materials, mix mortar, and set up and move scaffolding. (See the statement on construction laborers that appears elsewhere in the *Handbook*.)

Stonemasons often work from a set of drawings in which each stone has been numbered for identification. Helpers may locate and bring the prenumbered stones to the masons. A derrick operator using a hoist may be needed to lift large pieces into place.

When building a stone wall, masons set the first layer of stones into a shallow bed of mortar. They align the stones with plumblines and levels, and tap them into position with a wood mallet. Masons build the wall by alternating layers of mortar and stone. As the work progresses, they use a pointed metal tool to smooth the mortar to an attractive finish and fill the joints between stones. To hold stones in place, stonemasons sometimes weld or bolt pieces of metal within the wall. After positioning the rocks, they cover the metal with mortar. Finally, masons wash the stone to remove dirt and dry mortar.

When setting stone floors, masons trowel a thin layer of mortar over the surface. They then handset the stone in the mortar and leave the surface of the stone exposed. To finish, workers trowel the joints and wash the stone.

To make various shapes and sizes, masons use a special hammer to cut each stone along the grain. Valuable pieces often are cut with a saw that has a special blade.

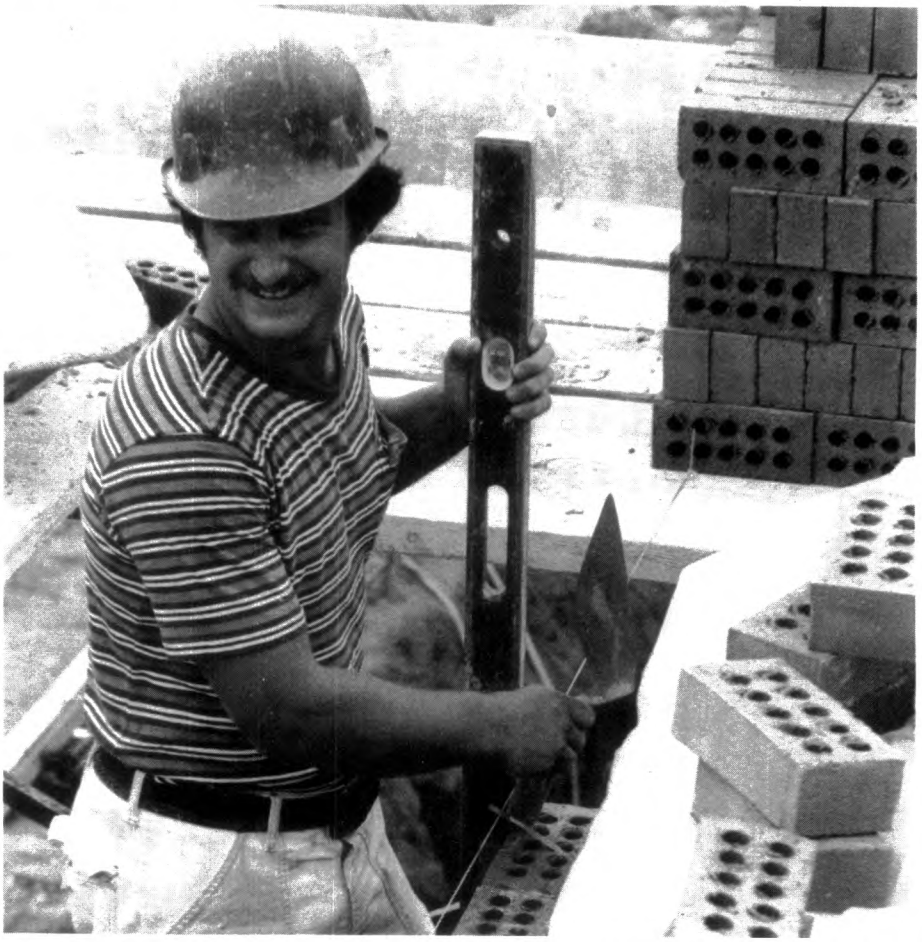
Setting marble is very much like setting stone. For floors and for walls where the holding strength of mortar alone is sufficient, masons often handset each marble piece into the mortar and leave the face of the marble exposed. For heavy pieces, workers employ a hoist to lift and position the marble. To secure heavy pieces on walls, masons use bolts in addition to mortar. Once the marble pieces are positioned and secured, workers mortar and trowel the joints and clean the marble's surface.

In addition to construction, stonemasons do repair work. They fill and cover holes and cracks in marble with mortar prepared and finished to look like the marble. They also polish and replace marble. Masons use a special saw to cut large pieces of metal.

Bricklayers and stonemasons primarily use handtools—including trowels, brick and stone hammers, wooden or rubber mallets, and chisels. For exacting cuts of brick, stone, or marble, they use high-powered electric saws equipped with special cutting blades.

### Working Conditions

Bricklayers and stonemasons usually work outdoors. They stand, kneel, or stoop for



After several months of carrying materials and mixing mortar, apprentices learn to align and lay brick.

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long periods and may have to lift heavy materials to complete a job. They also are subject to injuries from tools and falls from scaffolds. Despite the physical demands and general hazards of construction, however, these workers are less likely to be injured than other construction workers.

## Employment

About 163,000 bricklayers and stonemasons were employed in 1980; the vast majority were bricklayers. Workers in these crafts were employed primarily by special trade, building, or general contractors. A relatively small number of bricklayers work for government agencies or businesses that do their own construction and alteration.

Workers in these trades are employed throughout the country, but, like the general population, are concentrated in metropolitan areas. In cities that are too small to have a demand for full-time stonemasons, bricklayers will install stone or marble as a sideline.

About 1 out of 4 bricklayers and stonemasons is self-employed. Many of the self-employed specialize in contracting on small jobs such as patios, walks, and fireplaces.

## Training, Other Qualifications, and Advancement

Most bricklayers and some stonemasons pick up their skills informally by working as helpers or hod carriers and by observing and learning from experienced workers. The remainder learn their skills through apprenticeship, which generally provides the most thorough training.

Individuals who learn the trade informally usually become bricklayers. They start by carrying materials, moving scaffolds, and mixing mortar. However, it takes several months to a year before they are taught to spread mortar and lay brick. During this period, they also learn about building codes and regulations, information which later will help them select the material and techniques to do a job correctly. They begin with simple patterns and progress to more complex designs. Learning to set stone or marble might take several years.

Apprenticeships for bricklayers and stonemasons usually are sponsored by local contractors or by local union-management committees. The apprenticeship program requires 3 years of on-the-job training in addition to 144 hours of classroom instruction each year in subjects such as blueprint reading, mathematics, layout work, and sketching. Apprentices learn the general applications of brick, stone, and marble.

Apprentices start by carrying materials and mixing mortar. Within 2 or 3 months, they learn to align, lay, and clean brick. Apprentices eventually learn to work with stone and marble. After apprenticeship, they usually specialize in one of the two trades.

Applicants for apprenticeships must be at least 17 years old. Apprentice and helper applicants should be in good physical condition. A high school or vocational school education is preferable, as are courses in mathematics, mechanical drawing, and shop.

Experienced workers can advance to supervisory positions or become estimators. They also can open contracting businesses of their own.

## Job Outlook

Employment of bricklayers is expected to grow faster than the average for all occupations through the 1980's. Although a large number of job openings will result from growth in the demand for these workers, many other openings will arise as experienced bricklayers retire, die, or leave the occupation for other reasons.

As population and business growth create a need for new homes, factories, offices, and other structures, the demand for bricklayers will grow. Stimulating this growth will be the increasing use of brick for decorative work on building fronts and in lobbies and foyers. The use of brick, particularly for interior load-bearing walls and prefabricated brick panels, is growing and will add to overall employment needs.

Employment of stonemasons is expected to grow more slowly than the average for all occupations through the 1980's. Stone and marble have lost some popularity as building materials because they have become much more expensive than materials such as concrete. Nevertheless, a small number of jobs will become available, principally to replace stonemasons who retire, die, or leave the occupation.

Employment of bricklayers and stonemasons, like that of many construction occupations, is sensitive to changes in the economy, particularly changes in the level of construction for homes, factories, and other buildings. Workers in these trades can experience periods of unemployment, particularly when the level of construction activity drops.

## Earnings

According to a 1980 survey of cities with at least 100,000 inhabitants, average hourly union wage rates were $12.64 for bricklayers and $12.31 for stonemasons. Wage rates generally were highest in the West and lowest in the South. Limited information indicates that nonunion rates for experienced workers were less than union rates, generally ranging from $8 to $12 per hour, depending on the locale. However, yearly earnings for workers in these trades generally are lower than hourly rates would indicate because poor weather and fluctuations in construction activity adversely affect the annual number of hours they can work. The average wage for all nonsupervisory and production workers in private industry, except farming, was $6.66 an hour.

In each trade, apprentices or helpers start at about 50 percent of the wage rate paid to experienced workers. The rate increases as they gain experience.

A large number of bricklayers and stonemasons are members of the International Union of Bricklayers and Allied Craftsmen.

## Related Occupations

Bricklayers and stonemasons combine a thorough knowledge of brick, stone, and marble with manual skill to erect very attractive yet highly durable structures. Other occupations involving similar skills include cement masons, plasterers, terrazzo workers, and tilesetters.

## Sources of Additional Information

For details about apprenticeships or other work opportunities in these trades, contact local bricklaying, stonemasonry, or marble setting contractors; a local of the union listed above; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of either bricklayers or stonemasons, contact:

International Union of Bricklayers and Allied Craftsmen, International Masonry Apprenticeship Trust, 815 15th St. NW., Washington, D.C. 20005.

Information about the work of bricklayers also may be obtained from:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

Brick Institute of America, 1750 Old Meadow Rd., McLean, Va. 22101.

# Carpenters

(D.O.T. 860.281-010 through 860.381-054, 860.381-066 through 860.664-014, 860.681-010 through 860.684-014, 863.684-010, 869.361-018, .381-010, and -034)

## Nature of the Work

Almost all construction projects employ carpenters, the largest group of building trade workers. Carpenters perform a variety of jobs. In home building, for example, carpenters build the house framework, erect the walls and roof, and install doors, windows, flooring, cabinets, wood paneling and molding, and ceiling tiles. Other construction jobs done by carpenters include building wooden forms and chutes for pouring concrete, erecting scaffolding, and building wooden bridges, piers, trestles, tunnel supports, temporary shelters, and cofferdams.

The duties of carpenters vary by type of construction, type of company, skill of the carpenter, and size of the community. A carpenter employed by a special trade contractor, for example, may specialize in laying hardwood floors, while one who is employed by a general building contractor may build wall frames, put in insulation, and install paneling. Although each carpentry task is somewhat different, most tasks involve the following steps.

Working from blueprints, instructions from supervisors, or both, carpenters first do the layout—measuring and marking the building materials. Local building codes often dictate where certain materials can and cannot be

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used. Carpenters have to know these requirements. Carpenters cut and shape materials, such as wood, plastic, fiberglass, and drywall with hand and power tools, such as chisels, planes, saws, and drills. Carpenters then join the materials with nails, screws, or glue. They check the accuracy of their work with levels, rulers, and framing squares. To complete a task, carpenters may work in teams or be assisted by a helper.

In all assignments, carpenters must work quickly and economically. Taking too much time can delay other steps in the construction. Wasting material can cut the employers' profit.

A small proportion of carpenters are employed outside the construction industry in installation and maintenance work. For example, school districts employ carpenters to replace glass, ceiling tiles, and doors, and to repair desks, cabinets, and other furniture. In factories, carpenters may install machinery.

## Working Conditions

As in other building trades, the work is active and sometimes strenuous. Prolonged standing, climbing, and squatting often are necessary. Carpenters risk injury from slips or falls, from contact with sharp or rough materials, and from the use of sharp tools and power equipment. Many carpenters work outdoors.

Some carpenters change employers each time they finish a construction job. Others alternate between working for a contractor and working for themselves on small jobs.

## Employment

In 1980, about 970,000 carpenters were employed. Nearly 1 out of 3 was self-employed. Most carpenters work for contractors and who construct, remodel, or repair buildings and other structures. Some do construction and maintenance for government agencies, utility companies, and manufacturing firms.

Because of their versatility, carpenters are much less concentrated geographically than any other construction occupation.

Carpentry is the largest of the building trades.

## Training, Other Qualifications, and Advancement

Most training authorities recommend the completion of an apprenticeship as the best way to learn carpentry. A large number of workers in this trade, however, acquire their skills informally (for example, by working as carpenters' helpers).

Apprenticeship programs are administered by local chapters of Associated Builders and Contractors, Inc., and by local joint union-management committees of the United Brotherhood of Carpenters and Joiners, and the Associated General Contractors, or the National Association of Home Builders. The programs consist of 4 years of on-the-job training and a minimum of 144 hours of related classroom instruction each year, however, the the length of the program varies with the apprentice's skill. Apprenticeship applicants generally must be 17 years old and meet local requirements. For example, some locals give tests designed to measure an applicant's aptitude for carpentry.

On the job, apprentices learn elementary structural design and become familiar with common carpentry jobs such as form building, rough framing, and outside and inside finishing. They also learn to use the tools, machines, equipment, and materials of the trade. Apprentices receive classroom instruction in safety, first aid, blueprint reading and freehand sketching, basic mathematics, and different carpentry techniques. Both in the classroom and on the job, they learn the relationship between carpentry and the other building trades.

Informal on-the-job training usually is less thorough than an apprenticeship. The degree of training and supervision often depends on the size of the employing firm. A small contractor who specializes in homebuilding may provide training in only one area—rough framing, for example. In contrast, a large general contractor may provide training in several carpentry skills.

A high school or vocational school education is desirable, including courses in carpentry, shop, mechanical drawing, and general mathematics. Manual dexterity, good physical condition, and a good sense of balance are important. The ability to solve arithmetic problems quickly and accurately and to work closely with others is helpful.

Carpenters may advance to supervisors or general construction supervisors. Carpenters usually have greater opportunities than most other construction workers to become general construction supervisors because they learn more about the entire construction process in

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their work. Carpenters with sufficient money and managerial skill can become independent contractors.

## Job Outlook

Employment of carpenters is expected to increase about as fast as the average for all occupations through the 1980's. Because of the large number of people employed in this field, replacement needs are high. Job openings that result from the need to replace carpenters who transfer to other occupations retire, or die will exceed the number of openings created by growth.

In the long run construction activity should increase in response to increasing demand for new housing and industrial plants, and as existing industrial plants are renovated to make them more productive and energy efficient.

Although the employment outlook for carpenters is expected to be good over the long run, the number of job openings may fluctuate greatly from year to year. Building activity depends on many factors—interest rates, availability of mortgage funds, government spending, and business investment—that vary with the state of the economy. During economic downturns, job openings for carpenters are reduced because construction generally falls. Carpenters with all-round skills will have better opportunities than those who can only do relatively simple, routine types of carpentry.

Job opportunities for carpenters also vary by geographic area. The level of construction activity follows the movement of people and businesses among States and local areas and reflects differences in local economic conditions. Therefore, the number of job opportunities in a given year may fluctuate widely from area to area.

## Earnings

According to a survey of union wage rates in metropolitan areas, construction carpenters averaged $12.42 an hour in 1980. In comparison, the average hourly rate for production and nonsupervisory workers in private industry, except farming was $6.66. Annual earnings, however, may be lower than hourly rates would indicate, because carpenters lose worktime due to poor weather and occasional inavailability of jobs. Maintenance carpenters who generally have more steady employment, averaged $9.34 an hour in 1980, according to a survey of selected metropolitan areas.

Apprentices usually start at about 50 percent of the rate paid to experienced carpenters and receive an increase of about 5 percent every 6 months.

A large proportion of carpenters are members of the United Brotherhood of Carpenters and Joiners of America.

## Related Occupations

Carpenters are highly skilled workers who specialize in construction and repair work with wood and similar materials. Other skilled construction occupations are bricklayers, cement masons, electricians, pipefitters, plasterers, plumbers, stonemasons, and terrazzo workers.

## Sources of Additional Information

For information about carpentry apprenticeships or other work opportunities in this trade, contact local carpentry contractors, a local of the union mentioned above, a local joint union-contractor apprenticeship committee, or the nearest office of the State employment service or State apprenticeship agency.

For general information about this trade, contact:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

National Association of Home Builders, Manpower Development and Training Department, 15th and M St. NW., Washington, D.C. 20005.

United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave. NW., Washington, D.C. 20005.

Associated Builders and Contractors, Inc., 444 N. Capitol St. NW., Suite 409, Washington, D.C. 20001.

# Cement Masons and Terrazzo Workers

(D.O.T. 844.364-010, -014, .461-010, .684-010, 861.381-046, and -050)

## Nature of the Work

Cement masons place and finish concrete for many types of construction projects. The projects range from small jobs, such as patios and floors, to huge dams or miles of concrete highway. On small projects, a mason, assisted by one or two laborers, may do all of the masonry work; on large projects, a crew of several masons and many laborers may be employed. Among other tasks, cement masons may color concrete surfaces, expose aggregate in walls and sidewalks, or fabricate concrete beams, columns, and panels.

Terrazzo workers create attractive walkways, floors, patios, and panels by exposing marble chips and other fine aggregates on the surface of finished concrete. However, much of the preliminary work of terrazzo workers is similar to that of cement masons.

In preparing a site for placing concrete, cement masons make sure the forms for molding the concrete are set for the desired pitch and depth and are properly aligned. Masons direct the placing of the concrete and supervise laborers who use shovels or special rakes to place and spread the concrete. Masons then guide a "straightedge" (a long, straight piece of wood or metal) back and forth across the top of the forms to level the freshly poured concrete and to show low spots, where concrete is added and leveled again.

Immediately after leveling the concrete, masons carefully press a "darby" (a long, straight 1- by 4-inch piece of wood with smooth, rounded edges and a handle) with sweeping motions over the surface of the concrete, forcing heavy particles under and smoothing the top.

After darbying, masons wait until particles in the concrete settle to the bottom and excess water works its way to the surface. When the excess water evaporates and the concrete is firm but workable, masons complete their work.

Finishers first press an edger gently between the forms and the concrete and guide it carefully along the edge and the surface. This produces slightly rounded edges and helps prevent chipping or cracking.

For joints, finishers use a flat tool that has a smooth ridge protruding from the center. At specified spacings, workers make joints or grooves that help control cracking on the surface.

Next, finishers rub a float—a small and smooth, rectangular piece of wood—over the entire surface, carefully avoiding edges and joints. Floating embeds the heavier material deeper into the concrete, removes most imperfections, and brings the lighter material—sand and cement—to the surface.

As the final step, masons sweep the mortar with a trowel (a flat, metal tool) back and forth over the surface to create a smooth finish. On large jobs, trowels powered by gasoline or electricity are used.

Masons also produce other finishes. For a coarse, nonskid finish, masons brush the surface with a broom or stiff bristled brush. For a pebble-like finish, they embed gravel chips into the surface, leaving the tops of the chips exposed. For a neat appearance, they wash any excess cement from the exposed chips with a mild acid solution. For color, they sprinkle on a dye which they brush into the surface.

For concrete surfaces that will remain exposed after forms are stripped, such as columns, ceilings, and wall panels, cement masons locate and correct any defects. First, they chisel away high spots and loose concrete and smooth them out with a rubbing brick. They then fill the defects with a rich cement mixture and either float or trowel a smooth, uniform finish.

Some cement masons specialize in laying a mastic coat (a fine asphalt mixture) over concrete, particularly in buildings where sound-insulated or acid-resistant floors are specified.

Cement masons must know their materials and be familiar with various chemical additives which speed or slow the setting time. The effects of heat, cold, and wind on the drying time of cement must also be considered.

Attractive, marble-chipped terrazzo requires three layers of materials. First, either cement masons or terrazzo workers build a solid, level concrete foundation that is 3 to 4 inches deep.

After the forms are removed from the foundation, workers apply a 1-inch deep mix-

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ture of sandy concrete. When this layer becomes tacky, terrazzo workers partially embed metal dividing strips into the concrete wherever there is to be a joint or change of color in the terrazzo. Before this layer dries, workers make sure the tops of the ferrule strips are level with one another because they are to become a network of rigid dividers for the terrazzo panels, allowing for design and color variation between panels. They also help prevent cracks from developing in the finished terrazzo.

For the final layer, terrazzo workers blend a fine concrete mixture which may be color dyed. They pour this mixture into each of the panels, then hand trowel each panel until level with the tops of the ferrule strips. While the mixture is wet, workers toss marble chips of various colors into each of the panels. To completely embed the marble chips, workers roll a lightweight roller over the entire surface.

When the terrazzo is thoroughly dry, workers grind it with a terrazzo grinder (somewhat like a disk-type floor polisher, only much heavier). The surface is ground until even with the top of the ferrule strips. Pits and holes are filled and steel troweled for a smooth, level surface. Terrazzo workers clean, polish, and seal the dry surface for a rich, lustrous finish.

## Working Conditions

Mason or terrazzo work sometimes is fast-paced and strenuous. Since most finishing is done at ground level, workers must stoop, bend, and kneel. Some jobs are outdoors; however, work generally is halted during rain or freezing weather. To avoid chemical burns from uncured concrete and bad knees from frequent kneeling, many workers wear knee pads. Some workers also prefer water-repellent boots.

## Employment

About 113,000 cement masons and terrazzo workers were employed in 1980; terrazzo workers constitute a very small proportion of this group. Cement masons work for general contractors who construct projects such as highways or large buildings, and for contractors who do only concrete work. Some masons install resilient floors for specialty floor contractors. A small number of masons are employed by municipal public works departments, public utilities, and manufacturing firms that do their own construction work. Most terrazzo workers work for special trade contractors who install decorative floors and wall panels.

About 1 out of 10 cement masons and terrazzo workers is self-employed, a smaller proportion than in other building trades. Most self-employed masons specialize in small jobs, such as driveways, sidewalks, and patios; most terrazzo workers, in floors.

## Training, Other Qualifications, and Advancement

Cement masons and terrazzo workers learn their trade either through on-the-job training as helpers or through 2- or 3-year apprenticeship programs. Many masons first gain experience as construction laborers.

Teamwork is essential when working with freshly poured concrete.

On-the-job training programs consist of informal instruction from experienced workers in which helpers learn to use the tools, equipment, machines, and materials of the trade. They begin with simple tasks, such as spreading and using a straightedge on freshly placed concrete. As they advance, assignments become more complex, and helpers usually can do finishing work within a year.

Two- and three-year apprenticeship programs, usually jointly sponsored by local unions and contractors, provide on-the-job training in addition to 144 hours of classroom instruction each year. A written test and a physical exam may be required in certain areas. In the classroom, apprentices learn applied mathematics and safety. Three-year apprentices receive special instruction in layout work and estimating costs.

When hiring helpers and apprentices, employers prefer high school graduates who are at least 18 years old, in good physical condition, and licensed to drive. The ability to get along with others also is important because cement masons frequently work in groups. High school courses in shop mathematics and blueprint reading or mechanical drawing provide a helpful background.

Entry into apprenticeships and other training programs for these workers is expected to be easier than entry into programs for other construction occupations.

Experienced cement masons or terrazzo workers may advance to supervisors or contract estimators, or may open concrete contracting businesses.

## Job Outlook

Employment of cement masons and terrazzo workers is expected to grow faster than the average for all occupations through the 1980's. As the population and the economy grow, more masons will be needed to help build apartments, offices, industrial buildings, and other structures. The greater use of concrete as a building material—particularly in nonresidential construction—also will add to the demand for these workers. Prestressed concrete columns, for example, are increasingly replacing steel columns in large buildings. Besides job openings created by increased demand for these workers, many openings will arise as experienced masons retire, die, or leave the occupation for other reasons.

Employment of cement masons and terrazzo workers, like that of many construction occupations, is sensitive to ups and downs in the economy. Workers in these trades can experience periods of unemployment, particularly when the level of nonresidential building falls. On the other hand, temporary shortages of these workers may occur in some areas during peak periods of building activity.

## Earnings

According to a survey of union wage rates in cities with at least 100,000 inhabitants in 1980, cement finishers averaged $12.16 an hour; mosaic and terrazzo workers averaged $11.90 an hour. Wage rates were generally highest in the West and lowest in the South. In 1980, the average wage for all nonsupervisory and production workers in private industry, except farming, was $6.66 an hour. Union masons generally have higher wage rates than nonunion masons. Apprentices usually start at 50 to 60 percent of the rate paid to experienced cement masons or terrazzo workers.

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Annual earnings for cement masons, terrazzo workers, and apprentices generally are lower than hourly rates would indicate because the annual number of hours they work can be adversely affected by poor weather and fluctuations in construction activity.

Cement masons usually receive premium pay for hours worked in excess of the regularly scheduled workday or workweek. They often work overtime, because once concrete has been poured, the job must be completed.

A large proportion of cement masons and terrazzo workers belong either to the Operative Plasterers' and Cement Masons' International Association of the United States and Canada, or to the International Union of Bricklayers and Allied Craftsmen.

## Related Occupations

Cement masons and terrazzo workers combine skill with knowledge of building materials to construct buildings, highways, and other structures. Other occupations involving similar skills and knowledge include bricklayers, form builders, marblesetters, iron workers, stonemasons, and tilesetters.

## Sources of Additional Information

For information about apprenticeships and work opportunities, contact local cement finishing contractors; locals of unions previously mentioned; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or apprenticeship agency.

For general information about cement masons and terrazzo workers, contact:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

International Masonry Apprenticeship Trust, 815 15th St. NW., Washington, D.C. 20005.

National Ready-Mixed Concrete Association, 900 Spring St., Silver Spring, Md. 20910.

Operative Plasterers' and Cement Masons' International Association of the United States and Canada, 1125 17th St. NW., Washington, D.C. 20036.

Portland Cement Association, Old Orchard Rd., Skokie, Ill. 60076.

Prestressed Concrete Institute, 201 N. Wells St., Chicago, Ill. 60606.

# Drywall Installers and Finishers

(D.O.T. 842.381-010, .664-010, and .681-010; and 869.684-050)

## Nature of the Work

Developed as a substitute for wet plaster, drywall consists of a thin wall of plaster sandwiched between two pieces of heavy paper. It is used today for walls and ceilings of most new homes because it saves both time and money compared to traditional construction using plaster.

Two new occupations have emerged from the widespread use of this construction material: Drywall installers and drywall finishers. Installers fasten drywall panels to the framework inside houses and other buildings. Finishers do touchup work to get the panels in shape for painting.

Because drywall panels are manufactured in standard sizes—for example, 4 feet by 12 feet—installers must measure and cut some pieces to fit in small spaces, such as above and below windows. They also saw holes in panels for electric outlets, air-conditioning units, and plumbing. After making these alterations, installers apply glue to the wooden framework, press the panels against it, and nail them down. In some areas, installers hoist large ceiling panels in place with a sheet rock lift. A helper usually assists an installer in handling large, cumbersome panels.

Some installers specialize in hanging drywall panels on metal framework in offices, schools, and other large buildings. Following plans that indicate the location of rooms and hallways, they saw to size and bolt together metal rods and channels to make floor-to-ceiling frames. They use screws to attach the drywall panels. Workers also erect suspended ceilings. They hang metal bands from wires that are embedded in the concrete ceiling. Installers crisscross bands across the room to form rectangular spaces for ceiling panels.

After installing the drywall, finishers fill joints between panels with a quick-drying paste. Using the wide, flat tip of a special trowel, and brushlike strokes, they spread the paste into and along each side of the joint. Before the paste dries, workers use trowels to press a perforated paper tape into the paste and to scrape away excess paste. On large commercial projects, finishers may use automatic taping tools to apply the paste and tape in one step. When the first application of paste is dry, finishers apply another to fill any depressions and to make a smooth surface. Some finishers apply textured surfaces to walls and ceilings with trowels, brushes, or spray guns. Nail and screw heads also are covered with this compound. Sanding makes patched areas as smooth as the rest of the wall surface. Finishers also repair nicks and cracks caused by the installation of air-conditioning vents and other fixtures. Some finishers specialize in sanding, taping, or repair work.

## Working Conditions

As in other construction trades, drywall work sometimes is strenuous. Installers and finishers spend most of the day on their feet, either standing, bending, stooping, or squatting. Installers have to lift and maneuver heavy panels. Hazards include the possibility of falls from ladders and injuries from power tools. Because sanding paste to a smooth finish may create a great deal of dust, some finishers wear masks for protection.

## Employment

About 84,000 persons worked as drywall installers and finishers in 1980. Most worked for contractors who specialize in drywall installation; others worked for contractors who do all kinds of construction.

Installers and finishers are employed throughout the country but are concentrated in urban areas. In many small towns, carpenters install drywall and painters finish it.

## Training, Other Qualifications, and Advancement

Most drywall installers and finishers start as helpers and learn most of their skills on the job. Installer helpers start by carrying materials, holding panels, and cleaning up debris. Within a few weeks, they learn to measure, cut, and install panels. Eventually, they become experienced installers.

Finisher helpers begin by taping joints and touching up nail holes and scratches. They soon learn to install corner guards and to conceal openings around pipes. Near the end of their training, both installer helpers and finisher helpers learn to estimate costs of installing and finishing drywall.

Some installers learn their trade in an apprenticeship program. The United Brotherhood of Carpenters and Joiners of America, AFL-CIO, in cooperation with local contractors, administers an apprenticeship program in carpentry that includes instruction in drywall installation. In addition, local affiliates of the Associated Builders and Contractors, Inc. (ABC) conduct a similar training program for nonunion workers. Both 4-year programs combine classroom instruction with on-the-job training. The International Brotherhood of Painters and Allied Trades conducts a 2-year apprenticeship program for finishers.

Employers prefer high school graduates who are in good physical condition, but they frequently hire applicants with less education. High school or trade school courses in carpentry provide a helpful background for drywall work. Installers must be good at simple arithmetic.

After qualifying as an installer or finisher, a person who has leadership ability may become a supervisor within a few years. Some workers start their own drywall contracting businesses.

## Job Outlook

Employment of drywall workers is expected to grow faster than the average for all occupations through the 1980's as drywall continues to replace plaster as a building material. Besides workers hired to fill openings arising from increased demand, many will be needed to replace those who take jobs in other occupations, retire, or die.

Employment opportunities may be more favorable in commerical constructon than in residential construction, which is usually more sensitive to interest rates.

Drywall installation and finishing is indoor work. Unlike some other construction trades,

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these workers seldom lose work time because of adverse weather conditions.

Most job openings will be in metropolitan areas. Building contractors in small cities may not have enough business to hire full-time drywall workers.

## Earnings

According to limited information, drywall installers and finishers in 1980 averaged about $12 an hour, nearly twice the hourly average for nonsupervisory and production workers in private industry, except farming. Trainees start at about half the rate paid to experienced workers.

Some contractors pay installers and finishers according to the amount of work they complete—for example, from 5 to 6 cents for each square foot of panel installed. In a day, the average drywall worker installs 35 to 40 panels, each 4 feet by 12 feet.

A 40-hour week is standard for installers and finishers, but they sometimes work longer. Those who are paid hourly rates receive premium pay for overtime.

Some installers are members of the United Brotherhood of Carpenters and Joiners of America, and some finishers are members of the International Brotherhood of Painters and Allied Trades.

## Related Occupations

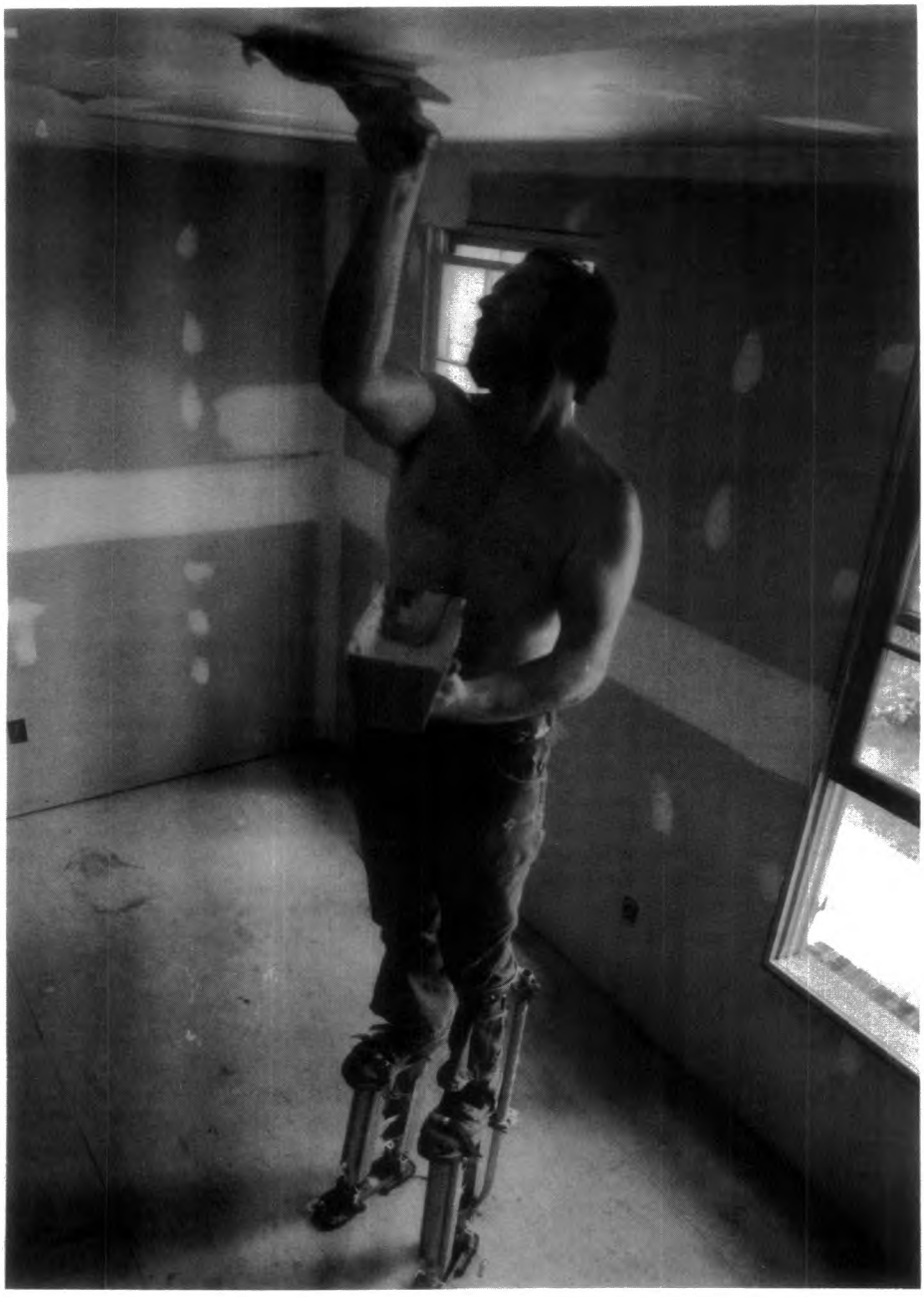
Drywall installers and finishers combine strength and dexterity with a capacity for precision and accuracy to make materials fit according to a set plan. Other occupations that require similar abilities include insulation workers, floor covering installers, and form builders.

## Sources of Additional Information

For details about job qualifications and training programs, write to:

Associated Builders and Contractors, Inc., 444 N. Capitol St. NW., Suite 409, Washington, D.C. 20001.

National Joint Painting, Decorating, and Drywall Apprenticeship and Training Committee, 1709 New York Ave. NW., Washington, D.C. 20006.



Specially designed stilts enable this finisher to reach joints between sections of drywall.

# Electricians (Construction)

(D.O.T. 821.261-014, .361-018, -030, -038, .684-014; 824.261-010, -014, .281-014, .681-010; 825.281-030, -034; 829.281-010, -014, .361-010, -014)

## Nature of the Work

Heating, lighting, power, air-conditioning, and refrigeration components all operate through electrical systems that are assembled, installed, and wired by construction electricians. These workers also install electrical machinery, electronic equipment and controls, and signal and communications systems. (Maintenance electricians, who usually maintain the electrical systems installed by construction electricians, are discussed elsewhere in the *Handbook*.)

Construction electricians follow blueprints and specifications for most installations. To install wiring in factories and offices, they may bend, fit, and fasten conduit (pipe or tubing) inside partitions, walls, or other concealed areas. Workers also fasten to the wall small metal boxes that will house electrical devices such as switches.

To complete circuits between outlets and switches, they then pull insulated wires or cables through the conduit. They work carefully to avoid damaging any wires or cables. In lighter construction, such as housing, plastic-covered wire usually is used rather than conduit. In any case, electricians connect the wiring to circuit breakers, transformers, or other components. Wires are joined by twisting ends together with pliers and covering the ends with special plastic connectors. When additional strength is desired, they may use an electric "soldering gun" to melt metal on to the twisted wires, then cover them with durable, electrical tape. When the wiring is finished, they test the circuits for proper connections.

For safety, electricians follow National Electrical Code specifications and procedures and, in addition, must comply with requirements of State, county, and municipal electrical codes.

Electricians generally furnish their own tools, including screwdrivers, pliers, knives, and hacksaws. Employers furnish heavier tools, such as pipe threaders, conduit benders, and most test meters and power tools.

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Electricians install wiring while a building is under construction.

## Working Conditions

Construction electricians are not required to have great physical strength, but they frequently must stand for long periods and work in cramped quarters. Because much of their work is indoors, electricians are less exposed to unfavorable weather than are most other construction workers. They risk electrical shocks, falls from ladders and scaffolds, and blows from falling objects. However, safety practices have reduced the injury rate.

## Employment

Over 290,000 construction electricians were employed in 1980. Most worked for electrical contractors; others were self-employed contractors. Like the general population, construction electricians are concentrated in industrialized and urban areas.

## Training, Other Qualifications, and Advancement

Most training authorities recommend the completion of a 4-year apprenticeship program as the best way to learn the electrical trade. Compared to most other construction trades, electricians have a higher percentage of apprentice-trained workers. Although many people learn the trade informally by working for several years as electricians' helpers, this method of training is declining in relative importance. Many helpers gain additional knowledge through trade school or correspondence courses, or through special training in the Armed Forces.

Apprenticeship programs are sponsored through and supervised by local union-management committees or by company management committees. Although the programs are separate, the content, training, and method of instruction are nearly identical. These programs provide 144 hours of classroom instruction each year in addition to comprehensive on-the-job training. In the classroom, apprentices learn blueprint reading, electrical theory, electronics, mathematics, and safety and first-aid practices. On the job, under the supervision of experienced electricians, apprentices must demonstrate mastery of electrical principles. At first, apprentices drill holes, set anchors, and set up conduit. Later, they measure, bend, and install conduit, as well as install, connect, and test wiring. They also learn to set up and draw diagrams for entire electrical systems.

Beginners who are not apprentices can pick up the trade informally in a variety of ways. For example, some begin work in manufacturing plants by piecing together electrical components. Others start in maintenance where they learn about circuit breakers, fuses, switches, and other electrical devices. Later, they broaden their knowledge by working as helpers for experienced electricians. While learning to install conduit, connect wires, and test circuits, helpers are also taught safety practices.

All applicants should be in good health and have at least average physical strength. Also important are agility and dexterity. Good color vision is important because workers frequently must identify electrical wires by color. Applicants for apprentice positions must be at least 18 years old and usually must be a high school or vocational school graduate with 1 year of algebra. Courses in electricity, electronics, mechanical drawing, science, and shop provide a good background.

To obtain a license, necessary for employment in some localities, an electrician must pass an examination which requires a thorough knowledge of the craft. Familiarity with the National Electric Code and with local electric and building codes is important.

Experienced construction electricians can advance to supervisors, superintendents, or contract estimators for contractors on construction jobs. Many electricians start their own contracting businesses. In many areas, a contractor must have an electrical contractor's license.

## Job Outlook

Employment of construction electricians is expected to increase about as fast as the average for all occupations through the 1980's. As population and the economy grow, more electricians will be needed to install electrical fixtures and wiring in new and renovated homes, offices, and other buildings. In addition to jobs created by increased demand for electrical work, many openings will arise as experienced electricians leave the occupation, retire, or die.

Although employment in this field is expected to grow over the long run, it may fluctuate from year to year due to ups and downs in construction activity. Some electricians may be laid off when the level of construction declines. When construction jobs are not available, however, some workers may transfer to jobs as maintenance electricians in industries that are less sensitive to cyclical swings in the economy than the construction industry.

Job opportunities may be more favorable in the South and West than in other regions of the Nation. Graduates of apprenticeship programs should have the best prospects for employment.

## Earnings

According to a survey of union wage rates in cities with 100,000 or more people, electricians averaged $13.46 an hour in 1980, compared with $6.66 an hour for all production and nonsupervisoury workers in private industry, except farming. Wage rates were generally higher in the West and lower in the South. Because the seasonal nature of construction affects electricians less than workers in most building trades, annual earnings also tend to be higher.

Apprentice wage rates start at from 40 to 50 percent of the rate paid to experienced electricians and increase periodically.

A large proportion of construction electricians are members of the International Brotherhood of Electrical Workers.

## Related Occupations

To install electrical systems, construction electricians combine manual skill and a knowledge of electrical materials and concepts. Other occupations involving similar skills include air-conditioning mechanics, cable installers and repairers, electronics mechanics, elevator constructors, and maintenance electricians.

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## Sources of Additional Information

For details about electrician apprenticeships or other work opportunities in this trade, contact local electrical contractors; a local chapter of the Independent Electrical Contractors, Inc.; a local chapter of the National Electrical Contractors Association; a local union of the International Brotherhood of Electrical Workers; a local union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency. Some local employment service offices screen applicants and give aptitude tests.

For general information about the work of electricians, contact:

Independent Electrical Contractors, Inc., 1101 Connecticut Ave. NW., Suite 700, Washington, D.C. 20036.

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

National Association of Lighting Maintenance Contractors, 313 Price Place, Suite 110, Madison, Wis. 53705.

National Electrical Contractors Association, 7315 Wisconsin Ave., Bethesda, Md. 20814.

National Joint Apprenticeship and Training Committee for the Electrical Industry, 9700-E George Palmer Hwy., Lanham, Md. 20706.

# Floor Covering Installers

(D.O.T. 864.381-010 and .481-010)

## Nature of the Work

Floor covering installers (also called *floor covering mechanics*) install and replace carpet or resilient floor covering materials such as tile, linoleum, and vinyl sheets. These workers install coverings over floors made of wood, concrete, or other materials. They generally specialize in either carpet or resilient floor covering installation, although some do both.

Before putting down resilient covering, such as vinyl tile, installers first inspect the floor to be sure that it is firm, dry, smooth, and free of dust or dirt. Some floors have to be prepared for covering. For example, installers may sand a rough or painted floor and fill cracks and indentations. An extremely uneven floor may be resurfaced with wood or other materials.

On newly poured concrete floors or floors laid over dirt, installers test for moisture. If too much moisture is present, they may suggest postponing installation of floor covering or recommend a covering technique suited to the floor's condition.

Resilient-flooring installers measure and mark off the floor according to a plan. The plan may be architectural drawings that specify every detail of the covering design, or a simple, verbal description by the customer. When the plan is completed, installers, often assisted by apprentices or helpers, cut, fit, and glue the flooring into place. Square tile is hand-set and tapped into place with a mallet. Sheet flooring is laid out and rolled with a roller in a fashion similar to that of rolling out pie dough. The flooring must be carefully cut, particularly at door openings, along irregular wall surfaces, and around fixtures, such as columns or pipes. Installers also must take special care in cutting out and arranging decorative designs. After the flooring is in place, they may run a roller over it to insure good adhesion.

Carpet installers, like installers of resilient coverings, first inspect the floor to determine its condition. Then they plan the layout after allowing for expected traffic patterns and, if necessary, for seams so that best appearance and long wear will be obtained.

For wall-to-wall carpet, installers lay and tack an underlay—a foam rubber pad 1/4 to 1/2 inch thick that is cut slightly smaller than the entire floor. Next, they roll out, measure, mark, and cut the carpet, allowing for 3 to 4 inches of extra carpet on each side. This provides some leeway for mistakes. Workers then lay the carpet and stretch it to fit evenly against the floor and snugly against each wall and door threshold. With the carpet stretched, the excess around the perimeter is cut to fit the room precisely. To hold the carpet in place, workers either tack or tape each edge of the carpet to the floor.

Because carpet comes in standard 12-foot widths, wall-to-wall installations in large rooms must be joined at the seams.

To join carpet, installers either hand-sew seams with a large needle and special thread or heat-tape seams with a hot, flat iron to melt the plastic surface of a foil-backed tape placed beneath the joined sections of carpet. Sections of carpet placed edge-to-edge are pressed to the surface of the melted plastic to force it into the carpet's backing. When cooled, the hardened plastic joins the sections.

For precut, edge-bound carpet, installers simply lay a foam rubber pad on the floor and roll the carpet over the slightly smaller pad. To hold the pad and carpet in place, installers may apply tape that has adhesive on both sides to the bottom edges of the carpet.

## Working Conditions

Installers work under nearly ideal conditions compared with other construction workers. Because floor coverings are finished products designed almost exclusively for interior use and display, work areas usually are clean, safe, and comfortable.

Installers generally work regular daytime hours. Particular circumstances, however, such as installing a floor in a store or office, may require work during evenings and weekends.

On the job, installers kneel, reach, stoop,

Flooring must be cut carefully along irregular wall surfaces and doorways.

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stretch, and frequently lift heavy loads, such as a roll of carpet, activities that require strength and stamina. They also must drill, cut, hammer, and use hot irons. Despite continual movement and frequent use of hand and power tools, installers experience fewer injuries than most other construction workers.

## Employment

An estimated 106,000 floor covering installers were employed in 1980, according to a Bureau of the Census survey. About three-fourths worked primarily with carpet, and the remainder with resilient flooring.

Most installers worked for flooring contractors. Many others worked for retailers of floor covering and home alteration and repair contractors. Over one-third of floor covering installers were self-employed, a higher proportion than the average for all construction occupations.

Installers are employed throughout the Nation, but are concentrated in urban areas that have high levels of construction activity.

## Training, Other Qualifications, and Advancement

The vast majority of floor covering installers learn their trade informally on the job by working as helpers to experienced installers. Others learn through formal apprenticeship programs, which include on-the-job training as well as related classroom instruction.

Informal training programs usually are sponsored by individual contractors and generally take about 1-1/2 to 2 years. Helpers begin with simple assignments. Helpers on resilient flooring jobs carry materials and tools, prepare floors for the tile, and help with its installation. Carpet helpers install tackless stripping and padding, and help stretch newly installed carpet. With experience, helpers in either trade take on more difficult assignments, such as measuring, cutting, and fitting the materials to be installed.

Apprenticeship programs and some contractor-sponsored programs provide comprehensive training that covers both carpet and resilient flooring work.

Floor covering installers occasionally attend manufacturers' schools to learn about new kinds of flooring.

Applicants for helper or apprentice jobs should be at least 16 years old, have manual dexterity, and be mechanically inclined. Since trainees often are required to drive company vehicles, employers prefer individuals who are licensed to drive and who have good driving records. Employers also want individuals who will be courteous and tactful in their dealings with customers. A high school education also is preferred, though not necessary. Courses in general mathematics and shop may provide a helpful background.

Floor covering installers may advance to supervisors or installation managers for large floor laying firms. Some installers become salespersons or estimators. Installers also may go into business for themselves.

## Job Outlook

Employment of floor covering installers is expected to grow about as fast as the average for all occupations through the 1980's. In addition to job openings resulting from growth in demand for floor covering installers, many openings will arise as experienced installers transfer to other occupations, retire, or die. Employment of floor covering installers is expected to increase mainly because of the expected expansion in construction and the more widespread use of resilient floor coverings and carpeting. Because many new buildings have plywood rather than hardwood floors, wall-to-wall carpet or resilient floors will be a necessity. Carpet and resilient flooring also will continue to be used extensively in renovation work. Moreover, versatile materials and colorful patterns will contribute to the growing demand for floor coverings.

Most job opportunities will be for carpet installers and workers who can install both carpet and resilient flooring. Since only about one-fourth of floor covering installers work primarily with resilient flooring, fewer opportunities will arise in this field.

## Earnings

Experienced floor covering installers earned around $10 per hour in 1980, according to the limited information available. Starting wage rates for apprentices and other trainees usually are about half of the experienced worker's rate.

Most installers are paid by the hour. In some shops, part of the pay may be in bonuses. In others, installers receive a monthly salary or are paid according to the amount of work they do.

Some floor covering installers belong to the United Brotherhood of Carpenters and Joiners of America, or the International Brotherhood of Painters and Allied Trades.

## Related Occupations

Floor covering installers skillfully combine strength and stamina with an eye for accuracy and an appreciation for detail to produce attractively finished floors. Other occupations involving different products but which require similar skills include appliance repairers, blasters, house repairers, lathers, meat cutters, painters, riveters, and roofers.

## Sources of Additional Information

For details about apprenticeships or work opportunities, contact local flooring contractors or retailers; locals of the unions previously mentioned; or the nearest office of the State apprenticeship agency or the State employment service.

For general information about the work of floor covering installers, contact:

Carpet and Rug Institute, P.O. Box 2048, Dalton, Ga. 30720.

# Glaziers

(D.O.T. 865.381-010 and -014)

## Nature of the Work

Glass serves many uses in modern buildings. Insulating glass keeps in warmed or cooled air; tempered and wire glass makes doors and windows more secure; and large glass panels give skyscrapers a distinctive look while reducing the need for artificial lighting. Glaziers install all types and sizes of building glass. For some jobs, the glass is precut and ready to install. For other jobs, the glazier must cut the glass before it can be installed.

To prepare the glass for cutting, glaziers rest it either on edge on a rack or A-frame or flat against a cutting table. They then measure and mark the glass to fit the opening.

Glaziers cut glass with a special tool that has a very hard metal wheel about 1/6 inch in diameter. Using a "straightedge" as a guide, the glazier presses the cutter's wheel firmly on the glass, guiding and rolling it carefully to make a score just below the surface. To help the cutting tool move smoothly across the glass, workers brush a thin layer of kerosene along the line of the intended cut or dip the cutting tool in kerosene. Immediately after cutting, the glazier presses on the short end to break the glass cleanly along the cut.

Glaziers may use a crane or hoist with suction cups attached to lift a large, heavy piece of glass. In all cases, however, to prevent shattering, glaziers use their hands to guide and position the glass precisely in its frame.

Glaziers secure glass in an opening with materials such as rubber gaskets, putty, metal clips, and metal or wood molding. When using a rubber gasket—a thick molded rubber half tube with a split running its length—to secure glass. They first position the gasket around the perimeter within the opening, then set the glass into the split side of the gasket, causing it to clamp to the edges and hold the glass firmly in place.

When using putty, workers first spread it neatly against and around the edges of the molding on the inside of the opening. Next, they install the glass. With it pressed against the putty on the inside molding, workers screw or nail outside molding that loosely holds the glass in place. To hold it firmly, they pack the space between the molding and the glass with putty and then trim any excess putty with a putty knife.

When metal clips and molding are used to secure glass, glaziers first secure the molding, then force springlike metal clips between the glass and the molding. The clips exert pressure and keep the glass firmly in place.

Glaziers also install glass doors, mirrors, and glass for table tops and display cases. They may mount steel and aluminum sashes or frames and attach locks and hinges to glass doors.

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In addition to handtools such as glasscutters and putty knives, glaziers use power tools, such as hoists, saws, drills, cutters, and grinders. They also use many types of sealants, mastics—a pastelike cement—and rubber moldings.

## Working Conditions

When installing large pieces of glass, glaziers work in teams. They may travel for a day or two to job sites in areas where few people, if any, are equipped and qualified to install glass in commercial buildings such as stores.

Glaziers may work outdoors in uncomfortable weather. Sometime they work on scaffolds at great heights. In addition, the job requires a considerable amount of bending, stooping, lifting, and standing. Glaziers may be injured by broken glass or cutting tools, falls from scaffolds, or from lifting glass.

## Employment

About 14,000 persons worked as construction glaziers in 1980. Most worked for glazing contractors engaged in new construction, alteration, and repair. Others worked for government agencies or businesses that do their own construction. Glaziers work throughout the country, but jobs are concentrated in metropolitan areas.

## Training, Other Qualifications, and Advancement

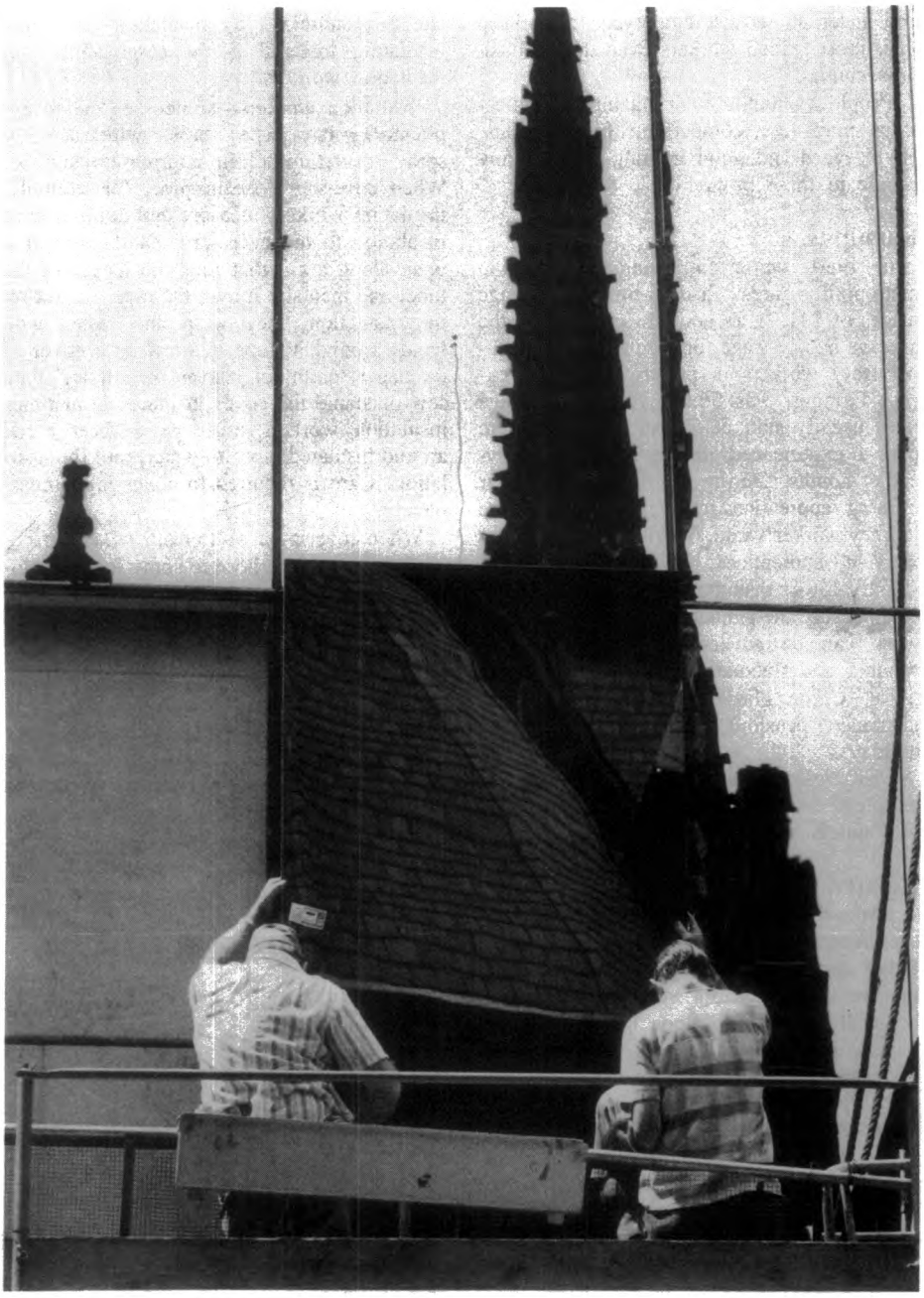
Training authorities recommend that glaziers learn the trade through a 3-year apprenticeship program. However, most glaziers learn the trade informally on the job by assisting experienced workers.

Apprenticeship programs, which are administered by local union-management committees, consist of on-the-job training as well as 144 hours of classroom and/or home study instruction each year.

On the job, apprentices learn to use the tools and equipment of the trade; handle, measure, cut, and install glass and metal framing; cut and fit moldings; and install and balance glass doors. In the classroom, they are taught basic mathematics, blueprint reading and sketching, general construction techniques, safety practices, and first aid.

Glaziers who learn this trade through informal on-the-job training usually start by carrying glass and cleaning up debris in glass shops. They often practice their cutting techniques on discarded glass. Eventually, helpers assist experienced workers on a simple installation job. Learning the trade this way may not provide training as complete as an apprenticeship and may take considerably longer.

Local union-management committees determine how apprentices are recruited and selected. Applicants for apprenticeships generally must be in good physical condition and at least 17 years old. In some areas applicants must take mechanical aptitude tests. Persons applying for helper positions will find that employers prefer high school or vocational school graduates. Courses in general mathematics, blueprint reading or mechanical drawing, general construction, and shop provide a helpful background.



Glaziers sometimes work on high scaffolds.

For most glaziers, advancement consists of increases in pay; some may advance to supervisory jobs.

## Job Outlook

Employment of construction glaziers is expected to increase as fast as the average for all occupations through the 1980's. Besides jobs created by increased demand for glaziers, openings will arise as experienced glaziers transfer to other occupations, retire, or die. However, because this occupation is fairly small, only a limited number of openings will become available. Employment opportunities should be greatest in metropolitan areas, where most glazing contractors are located.

Over the long run, population and business growth will create a rising demand for new residential and commercial buildings, such as apartments, offices, and stores. Since glass will continue to be popular in building design, the demand for glaziers to install and replace glass also will grow.

The number of job openings may fluctuate from year to year because employment in this trade is sensitive to changes in economic conditions. Some glaziers may experience periods of unemployment because of downturns in construction activity. However, most glaziers work on commercial construction projects that are less sensitive to economic downturns than residental construction. Glaziers can improve their chances of avoiding layoffs by learning to use a variety of tools

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and materials because employers try to keep their most skilled workers even during business slumps.

People wishing to enter glazing apprenticeships may face competition for positions. High wages and good training attract many people to these programs.

## Earnings

In 1980, union construction glaziers in metropolitan areas had estimated average wages of $11.91 an hour. In comparison the average hourly wage for production or nonsupervisory workers in private industries, except farming, was $6.66. Apprentice wage rates usually start at 50 percent of the rate paid to experienced glaziers and increase every 6 months. During the final year of their training, apprentices receive 90 percent of the journey worker's rate. Yearly earnings of glaziers and apprentices, however, generally are slightly lower than hourly rates would indicate because the annual number of hours they work can be adversely affected by poor weather and fluctuations in construction activity. Union glaziers also received health insurance, pensions, and paid vacation and holidays.

Many glaziers employed in construction are members of the International Brotherhood of Painters and Allied Trades.

## Related Occupations

Glaziers use their knowledge of construction materials and techniques to install glass. Other construction workers whose jobs also involve skilled, custom work are bricklayers, dry-wall applicators, floor layers, painters, paperhangers, stucco masons, terrazzo workers, and tile setters.

## Sources of Additional Information

For more information about glazier apprenticeships or work opportunities, contact local glazing or general contractors; a local of the International Brotherhood of Painters and Allied Trades; a local joint union-management apprenticeship agency; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of glaziers, contact:

International Brotherhood of Painters and Allied Trades, 1750 New York Ave. NW., Washington, D.C. 20006.

# Insulation Workers

(D.O.T. 863.364-010, .381-010 and -014, .664-010, and .685-010)

## Nature of the Work

Properly insulated homes and buildings reduce fuel costs by preventing excessive loss of cool air on warm days and hot air on cold days. Meat storage rooms, steam pipes, and boilers are other examples where the wasteful transfer of heat to or from the space inside can be minimized by insulation. Installing insulating material is the responsibility of insulation workers.

Insulation workers—sometimes called applicators—may paste, staple, wire, tape, or spray insulation to an appropriate surface. When covering a steam pipe, for example, insulation workers measure and cut a tube of insulation to the necessary length, stretch it open along a cut that runs the length of the tube, and then slip it over the pipe. To secure the insulation, they wrap and fasten wire bands around it, tape it, or wrap a cover of tar paper, cloth, or canvas over it and then sew or staple the cover in place. Sometimes insulation workers must weld sheet metal around insulated pipes to waterproof the insulation. Care is required to cover joints completely.

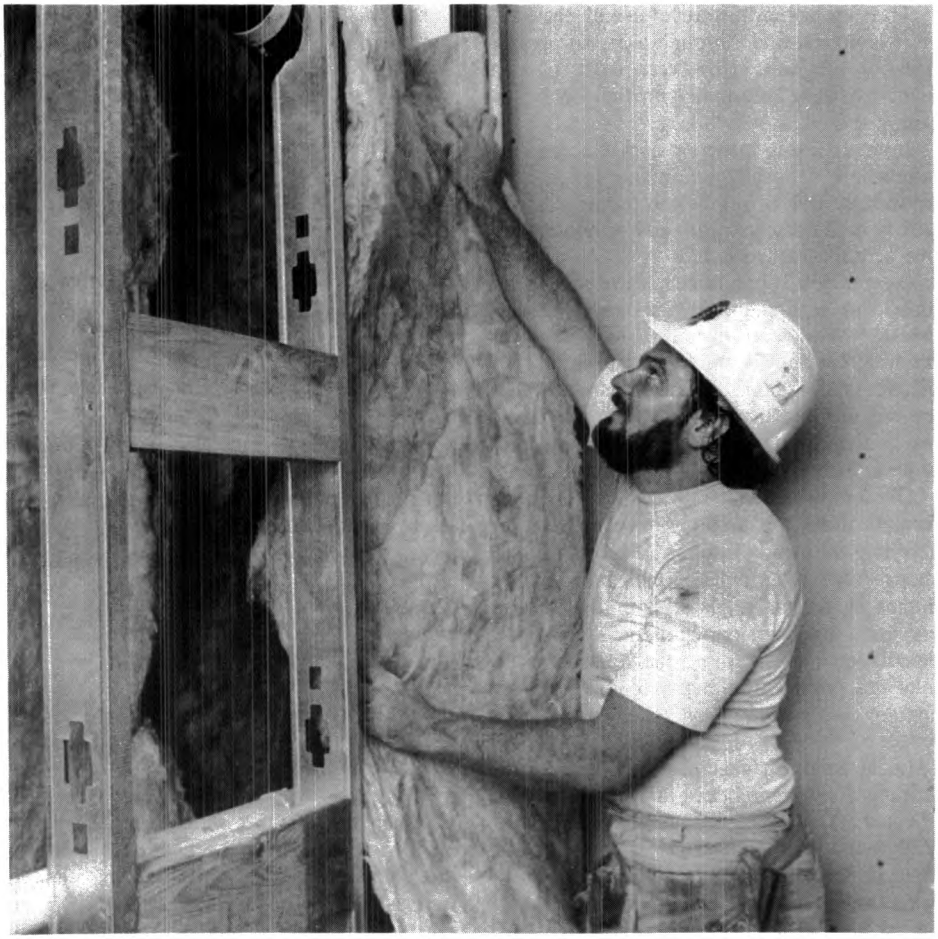
When covering a wall or other flat surface, workers may use a hose to spray foam insulation onto a wire mesh. The wire mesh provides a rough surface to which the foam can cling and adds strength to the finished wall. If desired, workers apply a final coat for a finished appearance.

In attics, which do not require either wire mesh for adhesion or a final coat for appearance, applicators use a compressor to blow in the insulation. Blowing in insulation is much faster and has become more popular in the housing industry. One worker feeds the machine with shredded fiberglass insulation or rock wool, and the compressor forces this insulation through a hose. Another worker sprays the insulation from the compressor hose into the attic or between the interior and exterior walls until the required amount is installed.

Insulation workers use common handtools—trowels, brushes, scissors, sewing equipment, and stapling guns. Powersaws, as well as handtools, are used to cut and fit insulating materials. Welding machines are often used to join sheet metal or secure clamps. Compressors for blowing or for spraying insulation are also used. Some insulation workers are responsible for cleaning these machines and keeping them in good working condition.

## Working Conditions

Insulation workers generally work indoors amid the clutter of construction. They spend most of the workday on their feet, either standing, bending, stooping, or squatting. Sometimes they work from ladders or in tight spaces. However, the work is not strenuous; it requires more coordination than strength. Insulation work is often dusty and dirty. The dust from insulation material can irritate the eyes, skin, and respiratory system. Tearing out asbestos—at one time the most common form of insulation but rarely used today—can be very dangerous. To protect themselves from the hazards of dust from asbestos and other insulating materials, workers wear fil-



Installing insulation requires more coordination than strength.

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tering masks and protective clothing. They try to keep work areas as well ventilated as possible.

## Employment

Most of the 45,000 insulation workers employed in 1980 worked for insulation contractors. Others altered and maintained insulation systems in chemical factories, petroleum refineries, powerplants, and similar structures that have extensive installations for power, heating, and cooling. Very few insulation workers are self-employed.

## Training, Other Qualifications, and Advancement

Insulation workers learn their trade through on-the-job training or a formal 4-year apprenticeship program; both of these methods of training stress conservation and safety. A trainee in an informal on-the-job program, usually provided by and paid for by an insulation contractor, is assigned to an experienced insulation worker for instruction and supervision. A trainee begins with simple tasks, such as blowing insulation, supplying insulation to experienced workers, or holding the material while it is fastened in place. On-the-job training can take from 1 to 2 years, depending on where the trainee works. Learning home insulation generally requires less training than maintenance and construction work in industrial plants. With experience, the trainee receives less supervision, more responsibility, and higher pay.

Trainees who receive informal instruction usually learn to specialize in only three or four types of installation. In contrast, trainees in apprenticeship programs receive in-depth instruction in almost all phases of insulation. Apprenticeship programs are provided by a joint committee of local insulation contractors and the local union of insulation applicators. State and local chapters of the Associated Builders and Contractors, Inc. conduct similar training programs for nonunion employees. Both programs consist of on-the-job training as well as classroom instruction, and trainees must pass practical and written tests to demonstrate a knowledge of the trade.

For entry jobs, insulation contractors prefer high school graduates who are in good physical condition and licensed to drive. High school courses in blueprint reading, shop math, sheet metal layout, and general construction provide a helpful background. Applicants seeking 4-year apprenticeship positions must have a high school diploma or its equivalent, and be at least 18 years old.

Skilled insulation workers may advance to supervisor, shop superintendent, or insulation contract estimator. Many insulation workers are members of the International Association of Heat and Frost Insulators and Asbestos Workers.

## Job Outlook

Employment of insulation workers is expected to grow faster than the average for all occupations through the 1980's as more new homes and businesses are insulated. Insulation for boilers and pipes in new factories and power plants also will stimulate employment growth. Moreover, old buildings that need extra insulation to save fuel will add to employment requirements. In addition to jobs created by increased demand for insulation work, openings will arise as workers transfer to other occupations, retire, or die.

Insulation workers in the construction industry may experience periods of unemployment. Building activity, particularly residential building activity, slows down during periods of rising interest rates.

Workers maintaining and repairing insulation systems in industrial plants will experience more stable employment than those in constructon because maintenance and repairs must be done regardless of the state of the economy.

Unlike other construction occupations, insulation workers usually do not lose work time when weather conditions are poor. Most insulaton is applied after the shell and roof of the building are constructed.

Employment opportunities will be best in metropolitan areas, where most insulation contractors are located. In small towns much of the insulation work is done by persons in other trades, such as heating and air-conditioning installers, carpenters, and drywall installers.

## Earnings

Union insulation workers in metropolitan areas had estimated average wages of $12.56 an hour in 1980, or about twice the hourly rate paid to nonsupervisory and production workers in private industry, except farming. Hourly wages for workers in the Southeast, for nonunion workers, and for full-time workers maintaining insulation systems in industrial plants may be $2 to $3 less than the average. Apprentice wage rates start at about half the rate paid to experienced workers and increase periodically.

## Related Occupations

Insulation workers combine a knowledge of insulating materials with their skills of application to provide effective barriers to heat, moisture, and sound. Other occupations involving similar skills include air-conditioning installers, carpet layers, drywall applicators, floor layers, lathers, and roofers.

## Sources of Additional Information

For information about insulation workers' training programs or other work opportunities in this trade, contact a local insulation contractor; a local of the International Association of Heat and Frost Insulators and Asbestos Workers; a State or local chapter of the Associated Builders and Contractors, Inc.; the nearest office of the State employment service or State apprenticeship agency, or:

National Insulation Contractors Association, 1120 19th St. NW., Washington, D.C. 20035.

Associated Builders and Contractors, Inc., 444 N. Capitol St. NW., Suite 409, Washington, D.C. 20001.

# Ironworkers

(D.O.T. 801.361-014, -018 and .684-026; 921.260-010; 869.683-014)

## Nature of the Work

Ironworkers erect the steel framework of buildings, bridges, and other structures. In addition, ironworkers install steel stairs or add window guards to buildings, and do repair work, such as replacing metal bridge parts. Four related jobs make up the ironworker occupation: Structural steel erecting, reinforcing metalwork, rigging, and ornamental ironwork assembling. Ironworkers often are skilled in all four jobs.

High-rise buildings, bridges, and power transmission towers have frames made of steel columns, beams, and girders. *Structural steel workers* erect these steel frames and assemble the cranes and derricks that move structural steel, reinforcing bars, buckets of concrete, and other materials around the construction site. The hoisting equipment arrives at the construction site in sections, where it is lifted into position by a mobile crane. Structural steel workers then connect the sections and set up the cables that do the hoisting.

Working from blueprints or instructions from supervisors, structural steel workers erect frameworks by connecting steel columns, beams, and girders. The steel is delivered to the construction site ready for assembly—cut to the proper size with holes drilled in the ends for bolts or rivets. Numbers that are written on the steel indicate where a piece fits in the framework. Structural steel workers unload and stack the steel so it can be hoisted easily when a piece is needed.

To hoist the steel, the workers attach cables from the crane or derrick. One worker directs the hoisting equipment operator with hand signals. Another worker holds a rope that is attached to the piece of steel to prevent it from swinging on the hoisting cable.

The steel is hoisted to the desired position in the framework, where several workers are waiting. These workers may be high off the ground. As the steel on the hoisting cable is lowered, the workers position it using crowbars, jacks, and handtools. Workers use drift pins or the handle of a spud wrench—a long wrench with a pointed handle—to align the holes in the piece of steel with the holes in the framework. Then they bolt the piece in place temporarily.

Before the steel piece can be permanently fixed to the framework, the workers must make sure it is vertically and horizontally straight. They check the alignment with plumb bobs and levels. When the piece is properly set, the workers bolt, weld, or rivet it permanently in place.

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Working with large steel columns requires strength and agility.

Reinforced concrete—concrete containing steel bars or mesh—is an important material in buildings, bridges, and other structures. The steel gives the concrete additional strength. *Reinforcing metal workers* set the bars in the wooden forms that hold concrete as it hardens.

Blueprints show the location, size, and number of reinforcing bars to be used in the structure. The bars are delivered to the construction site already cut to the proper lengths. Bars of the same size are bundled together and tagged, so workers can easily find the size they need.

Following blueprints or instructions from their supervisors, reinforcing metal workers position the bars in the forms. They fasten the bars together by wrapping wire around them with pliers. When reinforcing floors, workers place concrete blocks or bent pieces of metal under the reinforcing bars to hold them off the ground. Reinforcing metal workers sometime must cut the bars with hacksaws and acetylene torches, or weld bars together with arc-welding equipment. Some concrete is reinforced with a coarse mesh made of welded wire. When using mesh, workers measure the surface to be covered, cut and bend the mesh to the desired shape, and place it over the area to be reinforced. While a concrete crew pours the slab, workers use hooked rods to position the wire mesh in the freshly poured mixture.

At construction sites it is often necessary to move heavy materials other than structural steel. *Riggers* assemble the rigging—cables, pulleys, hooks—to move materials safely. They study the size, shape, and weight and select points of attachment that will provide a safe and secure hold on the load. Next, they hook or bolt one or more cables to both the hoisting equipment and the item to be moved. Workers then direct the load into position by giving hand signals and other directions to the hoisting machine operator.

*Ornamental ironworkers* install metal stairways, catwalks, floor gratings, ladders, metal cabinets, and window frames. They also install lampposts, fences, and decorative ironwork. In addition, they bolt or weld prefabricated aluminum, brass, and bronze frames and panels to buildings.

Most of the ornamental metal is cut and shaped away from the construction site, so ornamental ironworkers spend most of their time fitting, aligning, and assembling. On the job, workers make sure ornamental pieces fit correctly and hold firmly. Workers hacksaw oversized pieces to size and sometimes drill holes. For secure connections, they rivet or weld the metals.

## Working Conditions

Most ironworkers work outside a great deal of the time, in all kinds of weather. However, those who must work at great heights do not work when it is wet or extremely windy.

Ironworkers may be injured in falls. However, they use safety devices such as nets, safety belts, and scaffolding to reduce the number and severity of injuries.

Ironwork can involve considerable travel, because the amount of work available locally may be insufficent to keep crews continually employed.

## Employment

About 116,000 ironworkers were employed in 1980. Most of these workers are employed by general contractors, steel erection contractors, or ornamental iron contractors. Some are employed by large steel companies or their subsidiaries engaged in the construction of bridges, dams, and large buildings. Some work for government agencies, public utilities, or large industrial firms that do their own construction work. Very few are self-employed.

Ironworkers are employed in all parts of the country, but most work in metropolitan areas where most commercial and industrial construction takes place.

## Training, Other Qualifications, and Advancement

Most training authorities recommend the completion of an apprenticeship as the best way to learn these trades. However, a large number of ironworkers learn informally on the job.

Apprenticeship programs are administered by joint union-management committees made up of locals of the International Association of Bridge, Structural, and Ornamental Ironworkers and local chapters of contractors' associations. The apprenticeship consists of

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3 years of on-the-job training and a minimum of 144 hours a year of classroom instruction.

In the classroom, apprentices study the basics of structural erecting, rigging, reinforcing, and ornamental assembling, as well as blueprint reading, the care and safe use of tools and materials, and mathematics for layout work. On the job, apprentices get experience in all aspects of the trades, such as unloading and storing materials at the job site, rigging materials for movement by crane or derrick, connecting structural steel, and welding.

Ironworkers who learn the trades informally generally do not receive classroom training, although some large contractors have extensive training programs. Non-apprentice trainees receive on-the-job training that is similar to the training of apprentices, but they are not guaranteed experience in all aspects of the trades.

Applicants for ironworkers jobs generally must be at least 18 years old. A high school diploma may be preferred by employers and is required by local apprenticeship committees. Courses in general mathematics, mechanical drawing, and shop provide a helpful background.

Since materials used in ironworking trades are heavy and bulky, ironworkers must be in good physical condition. Agility and a good sense of balance also are required in order to work at great heights on narrow beams and girders.

Advancement opportunities for ironworkers are limited. Experienced ironworkers can become supervisors. Ironwork offers relatively few opportunities for self-employment because the work requires more equipment and workers than other types of contracting, such as plumbing and carpentry.

## Job Outlook

Employment of ironworkers is expected to increase about as fast as the average for all occupations through the 1980's to meet rising demand for office and industrial buildings, power transmission towers, and highway and bridge maintenance—types of construction that require extensive use of structural steel and reinforced concrete. Besides jobs resulting from growth in demand for these workers, many openings will result from the need to replace experienced ironworkers who transfer to other fields of work, retire, or die.

The number of job openings will fluctuate from year to year as economic conditions change. Construction activity is sensitive to changes in the level of interest rates, the amount of business investment, and the level of government spending. When these conditions are unfavorable, the level of construction generally falls, reducing job openings for ironworkers.

Job opportunities for ironworkers also vary by geographic area. The level of construction activity reflects differences in local economic conditions. Therefore, the number of job opportunities in a given year may vary widely from area to area.

Job openings for ironworkers usually are more abundant during the early spring when the weather warms up and the level of construction activity increases.

Many people are attracted to ironworker apprenticeship programs by the high wages and the opportunity for all-round training, thereby causing stiff competition for available positions.

## Earnings

The average hourly rates for structural and reinforcing ironworkers in large metropolitan areas were $12.73 and $12.55, respectively, in 1980—about twice the average wage of nonsupervisory and production workers in private industry, except farming. Apprentices start at 60 to 70 percent of the hourly rate paid to experienced workers. During apprenticeship, they receive increases every 6 months. Annual earnings for ironworkers, however, are generally lower than hourly wages would indicate because the number of hours they work in a year can be adversely affected by poor weather and layoffs between jobs.

Many workers in these trades are members of the International Association of Bridge, Structural, and Ornamental Iron Workers.

## Related Occupations

Ironworkers play an essential role in erecting buildings, bridges, power lines, and other structures. Other occupations important in these types of construction are form builders, layout workers, operating engineers, rough carpenters, and welder fitters.

## Sources of Additional Information

For more information on apprenticeships or other work opportunities, contact local general contractors; a local of the International Association of Bridge, Structural, and Ornamental Iron Workers; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or apprenticeship agency.

For general information about ironworkers, contact:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

Associated Builders and Contractors, 444 North Capitol St., Suite 409, Washington, D.C. 20001.

# Painters and Paperhangers

(D.O.T. 840.381-010, -014, -018, and .681-010; 841.381-010; and 845.681-010)

## Nature of the Work

Paint and wall coverings make rooms more attractive and comfortable. In addition, paints and similar materials protect outside walls from wear caused by the weather. Painters apply paint, varnish, and other finishes to buildings and other structures. (Information about production painters and automobile painters can be found elsewhere in the *Handbook*.) Paperhangers cover walls and ceilings of rooms with decorative wallpaper, fabric, vinyl, or other wall coverings. Although some people do both types of work, painting and paperhanging are separate skilled trades.

Painters prepare the surface to be covered so that the new paint will adhere properly. They use a variety of methods to remove old paint. They may loosen the paint with chemicals or special equipment such as "irons" that heat the paint causing it to crack. They then remove the loosened paint with sandpaper or wire brushes. When dealing with large amounts of loose, flaking paint, they clean the surface by blasting it with high pressure water hoses. Painters also remove grease, fill nail holes and cracks, sandpaper rough spots, and brush off dust. When painting new surfaces, they cover them with a primer or or sealer to make a suitable surface for the finish coat.

Painters use brushes, rollers, and spray guns to apply paint thoroughly, uniformly, and rapidly to surfaces such as wood, concrete, metal, masonry, plastic, or drywall. Brushes are used on trim and on hard-to-reach areas. Rollers and spray guns are used on even surfaces such as walls and ceilings. Both rollers and spray guns permit faster painting than brushes. Spray guns also are used on surfaces that are difficult to paint with a brush, such as cinder block and metal fencing.

Painters mix paints and match colors, using a knowledge of paint composition and color harmony. They also know the characteristics of common types of paints and finishes from the standpoints of durability, ease of handling, and application.

When working on tall buildings and similar structures, painters erect scaffolding, including "swing stages" (scaffolds suspended by ropes or cables attached to roof hooks) and "bosun chairs" (a device somewhat like a child's swing).

Although their materials differ, paperhangers and painters use similar techniques. The first step in paperhanging, as in painting, is to prepare the surface to be covered. To do this, paperhangers apply "sizing," a material that seals the surface and enables the paper to stick better. In redecorating, they may have to remove old paper by wetting it with water-soaked sponges or—if there are many layers—by steaming. Frequently, it is necessary for paperhangers to patch holes with plaster.

After carefully positioning the patterns to match at the ceiling and baseboard, paperhangers measure the area to be covered and cut a length of wallpaper from the roll. They then apply paste to the strip of paper, place it on the wall, and smooth it by hand or with a brush. They cut and fit edges at the ceiling and base, and smooth seams between strips

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Painters often have their own contracting business.

with a roller or other special tool. They inspect the paper for air bubbles and other imperfections in the work. Air bubbles are removed by smoothing the paper strip toward the outer edges. When working with wall coverings other than paper, such as fabric or vinyl, paperhangers follow the same general procedure.

## Working Conditions

Painters and paperhangers must stand for long periods. Their jobs also require a considerable amount of climbing and bending. A painter must have strong arms because much of the work is done with arms raised overhead. Painters and paperhangers risk injury from slips or falls off ladders and scaffolds. However, the injury rate for employees of painting, paperhanging, and decorating contractors in the construction industry has been significantly lower than the average for construction as a whole.

## Employment

About 382,000 painters and 21,000 paperhangers were employed in 1980. Many worked for contractors engaged in new construction, repair, alteration, or remodeling work. Organizations that own or manage large buildings such as hotels, offices, factories, and schools also employ maintenance painters.

A high proportion of workers in these trades are in business for themselves. Almost one-third of the painters and three-fourths of the paperhangers are self-employed. About one-fifth of all building trades workers are self-employed.

## Training, Other Qualifications, and Advancement

Painting and paperhanging are learned through apprenticeship or informal, on-the-job instruction. Most training authorities recommend completion of a formal apprenticeship as the best way to become a painter or paperhanger. The apprenticeship agreement guarantees the apprentice a set period of training in each skill of the trade. However, apprenticeship opportunities are severely limited, and many new workers begin as helpers to experienced painters. Few opportunities for informal training exist for paperhanger trainees because there are very few paperhangers and most work alone. As a result, a larger proportion of paperhangers than painters are trained through apprenticeship.

The apprenticeship for painters and paperhangers consists of 3 years of on-the-job training, in addition to 144 hours of related classroom instruction each year. Apprentices receive instruction in subjects such as color harmony, use of tools, surface preparation, blueprint reading, paint mixing and matching, wood finishing, and safety. They also learn the relationship between painting and paperhanging and the work performed by the other building trades.

On-the-job instruction, whether as an apprentice or as a helper, covers similar skills. Under the direction of experienced painters, trainees carry supplies, erect scaffolds, and do other simple tasks while they learn about the different kinds of paint and painting equipment. Within a short time, trainees learn to prepare surfaces for painting and paperhanging, to mix paints, and to apply paint and paper efficiently. Near the end of their training, they may learn decorating concepts, color coordination, and cost-estimating techniques.

Applicants for apprentice or helper jobs generally must be at least 16 years old and in good physical condition. A high school or vocational school education may be preferred by employers and required by local apprenticeship committees. Applicants should have manual dexterity and a good color sense.

Painters and paperhangers may advance to supervisory jobs with painting and decorating contractors. A sizable number establish their own painting and decorating businesses.

## Job Outlook

Applicants for jobs as painters can expect a large number of job opportunities through the 1980's because replacement needs are high in this large occupation. Opportunities for paperchangers will be significantly fewer because the occupation is relatively small.

Employment of both painters and paperhangers is expected to grow about as fast as the average for all occupations through the 1980's. Business growth will create a demand for new buildings and industrial structures. More painters will be needed to paint these new buildings and structures and to repaint older buildings. The continued popularity of

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wallpaper and other wall coverings will increase the demand for paperhangers as the number of buildings in use continues to rise.

Replacement needs will account for most of the job openings for painters and paperhangers. Each year thousands of jobs will become available as painters retire, die, stop working for other reasons, or transfer to other occupations. Many people work as painters for a short time and than leave the labor force or transfer to other types of work thus creating many job openings. Because there are relatively few paperhangers, the number of replacement openings in that trade is low.

Some painters and paperhangers may experience periods of unemployment because of downturns in construction activity. However, repainting and repapering provide many jobs for painters and paperhangers even when overall construction activity declines. Most painters and paperhangers work on industrial and commercial construction projects that are less sensitive to economic downturns than residential construction. Painters and paperchangers can improve their chances of avoiding layoffs by learning to use a variety of tools, paints, and wall coverings, because employers try to keep their most skilled workers even during business slumps.

People wishing to enter painting and paperhanging apprenticeships may face competition for positions. High wages and good training attract many people to these programs.

## Earnings

Hourly rates for union painters and paperhangers in the construction industry averaged about $12 in 1980, according to a survey of large metropolitan areas. In comparison, the average rate for nonsupervisory or production workers in private industry, except farming, was $6.66 an hour. The hourly rate for maintenance painters was about $9 in 1980. Annual income for some construction painters, particularly those on outside jobs, may not be as high as hourly rates would indicate because some worktime is lost due to bad weather and occasional unemployment between jobs.

Hourly wage rates for apprentices usually start at 50 percent of the rate paid to experienced workers and increase every 6 months until the full rate of pay is reached at the completion of apprenticeship.

A large proportion of painters and paperhangers are members of the International Brotherhood of Painters and Allied Trades. A few are members of other unions.

## Related Occupations

Painters use paints, varnishes, and lacquers to decorate and protect wood, metal, and other surfaces. Other occupations in which workers apply paints and similar finishes include spray painters, shipyard painters, metal sprayers, undercoaters, and transportation equipment painters.

Paperhangers decorate walls with paper, vinyl, and fabrics; related occupations include stucco masons, plasterers, and cement masons.

## Sources of Additional Information

For details about painting and paperhanging apprenticeships or other work opportunities in these trades, contact local painting and decorating contractors; a local of the International Brotherhood of Painters and Allied Trades; a local joint union-management apprenticeship committee; or the nearest office of the State apprenticeship agency or State employment service. To find out who administers the apprenticeship program in your area, contact:

International Brotherhood of Painters and Allied Trades, 1750 New York Ave. NW., Washington, D.C. 20006.

Painting and Decorating Contractors Association of America, 7223 Lee Hwy., Falls Church, Va. 22046.

For general information about the work of painters and paperhangers, contact:

National Joint Painting, Decorating, and Drywall Finishing Apprenticeship and Training Committee, 1709 New York Ave. NW., Suite 110, Washington, D.C. 20006.

Associated Builders and Contractors, 444 N. Capitol St., Suite 409, Washington, D.C. 20001.

# Plasterers

(D.O.T. 842.361-018, -022, and -026, and .381-014)

## Nature of the Work

Plasterers finish interior walls and ceilings with many types of plaster materials that form fire-resistant and relatively soundproof surfaces and they apply durable cement plasters, epoxy finishes, and stucco to exterior surfaces. They also cast ornamental designs in plaster.

To interior surfaces such as cinder block and gypsum lath, plasterers apply two coats of plaster. The first or "brown" coat is a heavy, brown mixture; the second or "finish" coat is a thin, pasty plaster. When the foundation consists of metal lath (a supportive wire mesh), plasterers first apply a preparatory coat to the lath.

When applying this preparatory or "scratch" coat, plasterers either spray or use a trowel (a flat, 4-inch by 10-inch metal plate with a handle) in wavelike motions to spread a thick, gritty plaster into and over the metal lath. Before the plaster on the lath dries, workers scratch its already uneven surface with a rakelike tool, producing ridges so the brown coat will cling tightly.

For the brown coat—whether applied to a scratch coat, cinder block, or gypsum lath—workers prepare a thick but smooth plaster. Workers either spray or trowel this mixture onto the surface, pushing plaster into cracks and holes and then smoothing the plaster to an even, level surface for finishing.

For the finish coat, plasterers prepare a thin plaster of very fine granules. They usually work this mixture very quickly onto the brown coat using a trowel, brush, and water. This mixture, which hardens very quickly, produces a very thin, smooth finish.

Plasterers create decorative surfaces as well. For example, while the final coat is still moist, they press firmly against the surface with a brush and use a circular hand motion to create decorative swirls.

Sometimes plasterers prepare drywall for painting. They point and tape the joints between the drywall sheets and apply a thin plaster coat over the entire surface of the drywall.

For exterior work, plasterers usually apply a gritty mixture of white cement and sand—stucco—over cement, concrete, and masonry. Sometimes stucco is applied directly to a wire lath scratch coat. As an alternative, they embed marble or gravel chips about halfway into a extra heavy mixture of plaster to achieve a uniform, pebble-like surface as an outer coat.

Some plasters apply insulation systems to the exteriors of new and old buildings. They cover the outer wall with insulation board and fiberglass cloth and then trowel on a layer of primus cement. They may apply an additional coat of plaster material for a decorative finish.

Plasterers sometimes do complex decorative and ornamental work that requires much more skill than other plastering and provides an opportunity for an individual to be creative. For example, they may mold intricate designs for the walls and ceilings of public buildings. To make these designs from an architect's blueprint, plasterers pour a special plaster into a mold, and allow time for drying. When these are dry, workers remove the molded plaster and paste it to the desired surface.

Plasterers use many special tools. They hold the plaster mixture on a hawk (a light metal plate with handle) and apply the wet mixture with a trowel. Smoothing and finishing are done with straightedges, beveledges, rods, floats, and other handtools. They also may use spray machines to apply plaster on both base and finish coats.

## Working Conditions

Plasterers work outside when applying stucco but most jobs are indoors. Sometimes plasterers work on scaffolds high above the ground to finish walls and ceilings.

Plastering is physically demanding—requiring considerable standing, stooping, lifting, and reaching overhead.

## Employment

Plasterers—who numbered about 24,000 in 1980—work mostly on new construction and alteration work, particularly where special architectural and lighting effects are part of the job. Some plasterers repair and renovate older buildings. Many plasterers are employed in Florida, California, and the Southwest, where stucco work is very popular.

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Plasterers must work quickly, applying and smoothing the plaster before it hardens.

Most plasterers work for independent contractors. About 1 out of every 4 plasterers is self-employed.

## Training, Other Qualifications, and Advancement

Most training authorities recommend completion of an apprenticeship as the best way to learn plastering. However, many people learn the trade by working as helpers, observing and being taught by experienced plasterers.

Apprenticeship programs, sponsored by local joint committees of contractors and unions, generally consist of 4 years of on-the-job training, in addition to at least 144 hours annually of classroom instruction in drafting, blueprint reading, and mathematics for layout work. Individuals who show exceptional ability may complete the programs in less time. Local chapters of the Associated Builders and Contractors, Inc. conduct similar training programs for nonunion workers.

In class, apprentices start with a history of the trade and the industry. They also learn about the uses of plaster, costs, and many other subjects. On the job, they learn about lath bases, plaster mixes, methods of plastering, blueprint reading, and safety. Experienced plasterers direct and help apprentices. Some apprenticeship programs allow individuals to obtain training in related occupations such as cement masonry and bricklaying.

Those who learn the trade informally as helpers usually start by carrying materials, setting up scaffolds, and mixing plaster. In a short time, they learn—through trial and error—to apply the scratch and brown coats. Learning to apply the finish coat takes considerably longer.

Applicants for apprentice or helper jobs generally must be at least 17 years old, be in good physical condition, and have manual dexterity. Applicants who have a high school or vocational school education are preferred. Courses in general mathematics, mechanical drawing, and shop provide a useful background.

Plasterers may advance to supervisors, superintendents, or estimators for plastering contractors, or may become self-employed.

## Job Outlook

Employment of plasterers is expected to increase more slowly than the average for all occupations through the 1980's. Most job openings will result from the need to replace workers who transfer to other occupations, retire, or die. Throughout much of the 1960's and early 1970's, employment of plasterers declined steadily as more builders switched to drywall construction, which saves both time and money. This decline has halted in recent years, however, and employment of plasterers is expected to rebound somewhat as a result of increased emphasis on saving energy. Insulating systems that use insulation board and trowelled finishes have produced some resurgence in demand for plasterers by commercial and multifamily home builders. In addition, plasterers will be needed to renovate plaster work in older structures and create special architectural shapes such as curved surfaces, which are not practical for drywall materials.

Because most plasterers work in construction, employment prospects may fluctuate from year to year due to changing economic conditions. High interest rates, which generally discourage building activity, may result in experienced plasterers as well as apprentices and helpers being laid off or having limited job openings.

Adverse weather conditions affect plastering less than other construction trades because much of this work is indoors. When applying finishes to exterior surfaces however, plasterers may lose work time because some materials cannot be applied in rain or snow or when temperatures are very cold.

## Earnings

Union wages for plasterers in metropolitan areas averaged an estimated $12 an hour in 1980, or about twice the average wage of all nonsupervisory workers in private industry, except farming. Nonunion workers and workers in small cities and rural communities generally earn less. Apprentice wage rates start at about half the rate paid to experienced plasterers and increase 10 percent every 6 months. However, yearly earnings for plasterers and apprentices are generally lower than hourly rates would indicate because poor weather and fluctuations in construction can adversely affect the annual number of hours they work.

A large proportion of plasterers are members of unions. They are represented by either the Operative Plasterers' and Cement Masons' International Association of the United States and Canada, or the Bricklayers and Allied Craftsmen International Union.

## Related Occupations

Other construction occupations in which workers use a trowel as the primary tool include cement masons, bricklayers, stonemasons, and tilesetters.

## Sources of Additional Information

For information about apprenticeships or other work opportunities, contact local plastering contractors; locals of the unions previously mentioned; a local joint union-management apprenticeship committee; a state or local chapter of the Associated Builders and Contractors, Inc.; or the nearest office of the State apprenticeship agency or the State employment service.

For general information about the work of plasterers, contact:

Bricklayers and Allied Craftsmen International Union, 815 15th St. NW., Washington, D.C. 20005.

Operative Plasterers' and Cement Masons' International Association of the United States and Canada, 1125 17th St. NW., Washington, D.C. 20036.

Associated Builders and Contractors Inc., 444 N. Capitol St. NW., Suite 409, Washington, D.C. 20001.

# Plumbers and Pipefitters

(D.O.T. 862.261-010, .281-010 and -014, .361-014 and -018, and .381-014, -018, -022, -026, -030, and -034, .681-010, .682-010, and .684-026 and -034)

## Nature of the Work

By simply turning on a faucet, a person activates a long, complex system of pipes.

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Small copper or plastic pipes connect the faucet to the building's main water pipes. These pipes in turn are connected to the cast iron or concrete pipes of the municipal water system that run underground for miles to a water treatment plant. Larger pipes connect the plant to a river, reservoir, or other water source.

Other pipe systems dispose of waste, fight fires, and transport water and steam for cooling and heating. Pipe systems in powerplants play an essential role in producing electricity by carrying the steam that powers huge turbines. Pipes also are used in manufacturing plants to move material through the production process.

Plumbers and pipefitters install and maintain the various pipe systems used in homes and businesses. Although plumbing and pipefitting are sometimes considered a single trade, workers may specialize in either craft. Plumbers build and repair the water, waste disposal, and gas systems in homes and other buildings. They also install plumbing fixtures—bathtubs, sinks, and toilets—and appliances such as dishwashers. Pipefitters build and repair both high and low pressure pipe used in manufacturing, generation of electricity, and transportation. They may specialize further, according to the type of pipe system with which they work. Steamfitters, for example, install pipe systems that move liquids or gases under high pressure. Sprinklerfitters install automatic fire control sprinkler systems in buildings.

Because the purpose, size, and operation of pipe systems differ, the materials and construction techniques used by plumbers and pipefitters vary by construction project. Water systems in homes, for example, use copper, plastic, and galvanized steel pipe that can be handled and installed by one or two workers. Municipal sewage systems, on the other hand, are made of large clay pipe. Installation requires several pipefitters. Despite these differences, all plumbers and pipefitters must be able to follow building plans and instructions from supervisors, lay out the job, and work efficiently with the materials and tools of the trade. The following example illusrates how plumbers use these skills to install piping in a house.

Working from blueprints or shop drawings that show the planned location of pipes, plumbing fixtures, and appliances, plumbers lay out the job to fit the piping into the structure of the house with the least waste of material and without damaging the structure. They measure and mark areas where pipe will be installed and connected. They also check for obstructions such as electrical wiring, and plan how to install pipe around the problem.

To install the piping, plumbers may saw holes in walls, ceilings, and floor. They may hang steel supports from ceilings that will hold the pipe in place. To assemble the system, plumbers cut and bend lengths of pipe using saws, pipe cutters, and pipe bending machines. They connect lengths of pipe with fittings; the method depends on the type of pipe used. For copper pipe, plumbers slide fittings over the end of the pipe and solder the fitting in place with a torch. For steel pipe, plumbers thread the end with a pipe threading machine and screw the pipe into the fitting.

When the piping is in place, plumbers install the fixtures and appliances and connect the system to the outside water and sewer lines. Using pressure gauges, they check the system to insure that the plumbing works properly.

## Working Conditions

Plumbing and pipefitting work is demanding. Workers do a lot of heavy lifting and must stand for long periods, Plumbers and pipefitters work both indoors and outside in all types of weather. They often work in cramped and dirty places. They can be injured by falls from ladders, cuts from sharp tools, and burns from hot pipes.

## Employment

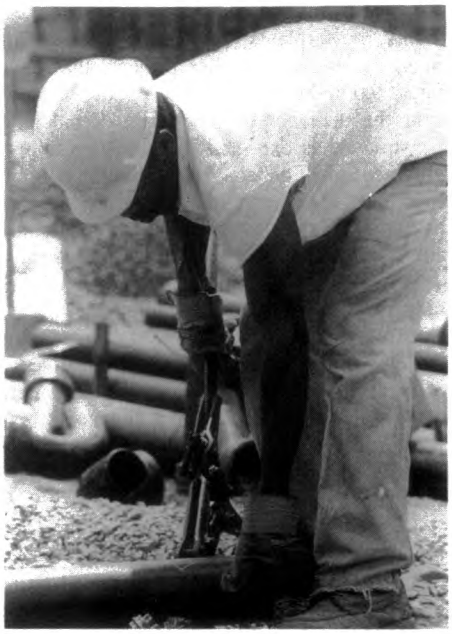
Most plumbers and pipefitters—who numbered about 407,000 in 1980—work for mechanical and plumbing contractors engaged in new construction or repair, alteration, or modernization work. About 1 out of 10 plumbers and pipefitters is self-employed. Some plumbers install and maintain pipe systems for government agencies and public utilities, and some work on the construction of ships and aircraft. Others do maintenance work in industrial and commercial buildings. Pipefitters, in particular, are employed as maintenance personnel in the petroleum, chemical, and food-processing industries where manufacturing operations require the moving of liquids and gases through pipes.

## Training, Other Qualifications, and Advancement

Apprenticeship is the best way for plumbers or pipefitters to learn all aspects of these trades. A large number of people, however, learn plumbing and pipefitting by working for several years as helpers to experienced plumbers and pipefitters.

Apprenticeship programs for plumbers and pipefitters are administered by local union-management committees of the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry and the Mechanical Contractors Association of America, Inc. or the National Association of Plumbing-Heating-Cooling Contractors and by local chapters of the Associated Builders and Contractors and the National Association of Plumbing-Heating-Cooling Contractors. Apprenticeships consist of 4 years of on-the-job training, in addition to at least 216 hours annually of related classroom instruction. Classroom subjects include drafting and blueprint reading, mathematics applied physics and chemistry, safety, and local plumbing codes and regulations.

On the job, apprentices first learn basic skills such as how to identify grades and types of pipe, how to use the tools of the trade, and how to unload materials safely. As apprentices gain experience, they learn how to work with various types of pipe and how to install different piping systems and plumbing fixtures.



On-the-job experience is an essential part of the plumber's training.

People learning the trade as helpers acquire their skills by observing and assisting experienced plumbers and pipefitters. These workers may not learn to work with as wide a variety of materials and piping systems as apprentices.

Applicants for apprentice or helper jobs generally must be at least 18 years old and in good physical condition. Employers prefer high school graduates. Courses in shop, plumbing, general mathematics, drafting, blueprint reading, and physics are helpful. Applicants may be given tests to determine whether they have the mechanical aptitude required in these trades.

Most communities require plumbers to be licensed. To obtain a license, workers must pass a special examination to demonstrate knowledge of the trade and of local plumbing codes.

Some plumbers and pipefitters may become supervisors for mechanical and plumbing contractors. Others go into business for themselves. As they expand their activities, they may employ other workers and become contractors.

## Job Outlook

Employment of plumbers and pipefitters is expected to grow about as fast as the average for all occupations through the 1980's as overall construction activity expands. Besides the jobs created by increased demand for plumbers and pipefitters, many openings will occur each year from the need to replace experienced workers who retire, die, or stop working for other reasons.

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Construction of oil refineries, chemical plants, powerplants, pipelines, office buildings, factories, and other projects that have large, complex pipe systems is expected to spur the demand for pipefitters. Residential construction is expected to contribute to employment of plumbers. Home building, however, declines when interest rates are high, so the number of jobs openings in residential construction may fluctuate from year to year.

Although some plumbers and pipefitters may face periods of unemployment when construction activity declines, employment of these workers generally is less sensitive to changes in economic conditions than many other construction trades. Maintenance of existing piping systems provides jobs for many plumbers and pipefitters even when construction activity declines.

People wishing to enter plumbing and pipefitting apprenticeships are likely to face competition. High wages and all-round training opportunities attract many people to these programs.

## Earnings

According to a survey of large metropolitan areas, hourly wage rates for union plumbers and pipefitters in construction in 1980 averaged $12.98 and $13.54, respectively. Maintenance pipefitters averaged $10.53 an hour in metropolitan areas. In comparison, the average wage for nonsupervisory and production workers in private industry, except farming, was $6.66. Apprentice wage rates start at 40 to 50 percent of the rate paid to experienced plumbers or pipefitters and increase every 6 months.

Many plumbers and pipefitters are members of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada. Some plumbers and pipefitters who are contractors are members of the National Association of Plumbing-Heating-Cooling Contractors.

## Related Occupations

Other occupations in which workers install and repair mechanical systems in buildings are boilermakers, electricians, elevator constructors, environmental control system installers and servicers, hot air furnace installers and repairers, millwrights, oil burner servicers and installers, and sheet-metal workers.

## Sources of Additional Information

For information about apprenticeships or work opportunities in plumbing and pipefitting, contact local plumbing, heating, and air-conditioning contractors a local chapter of the Mechanical Contractors Association; a local of the union mentioned above; a local joint union-management apprenticehip committee; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of plumbers, pipefitters, and sprinklerfitters, contact:

National Association of Plumbing-Heating-Cooling Contractors, 1016 20th St. NW., Washington, D.C. 20036.

Associated Builders and Contractors, 444 N. Capitol St., Suite 409, Washington, D.C. 20001.

National Automatic Sprinkler and Fire Control Association, P.O. Box 719, Mt. Kisco, N.Y. 10549.

Mechanical Contractors Association of America, 5530 Wisconsin Ave., Suite 750, Washington, D.C. 20015.

# Roofers

(D.O.T. 866.381-010, 866.381-014, and 866.684-010)

## Nature of the Work

A leaky roof can result in damage to ceilings, walls, and furnishings. To keep out water, roofers install and repair various kinds of roofing materials such as tar and gravel, rubber, slate shingles, and tiles. Reroofing—installing new roofs on existing buildings—accounts for about 80 percent of all roofing work. Roofers also may waterproof walls and floors.

There are two types of roofs, flat and pitched (slanted). Most commercial and industrial buildings have flat roofs. Most houses have pitched roofs. Roofers may work with both types, although many roofing contractors specialize in residential installation and repair. A roofer's work varies with the type of roof and roofing involved.

Most flat roofs are covered with several layers of materials. Roofers first put a layer of insulation on the roof deck. They then spread a coat of hot bitumen over the roof's insulation. Next they lay roofing felt (fabric saturated in bitumen) over the entire surface. The roofers then apply hot bitumen from a bucket, using a mop to spread it over and under the felt. This seals the seams and makes the surface watertight. Roofers repeat these steps to build up the desired number of layers (called plies), ending with a thick layer of bitumen over the surface. The top layer is sometimes glazed to make a smooth finished coat or gravel is embedded while it is still hot.

Some flat roofs are covered with a single ply system often made of waterproof rubber. Roofers roll the rubber over the roof's insulation, and seal the seams. They stick it in place with an adhesive and a dry ballast of blocks or stone.

Most house roofs are covered with asphalt, tile, slate, or wooden shingles. When applying asphalt shingles, roofers first lay, cut, and tack 3-foot strips of roofing felt lengthwise over the entire roof. Then, starting from the bottom edge, they nail overlapping rows of asphalt shingles to the roof. Workers measure and cut the felt and shingles to fit around corners, pipes, and chimneys. Wherever two roof surfaces intersect or shingles touch a pipe or chimney, roofers cement or nail flashing (strips of felt or metal) over the joints to make them watertight. Finally, roofers cover exposed nailheads with cement to prevent rust and water leakage. Slate shingles and tiles are installed in a similar manner.

Some roofers also waterproof and dampproof masonry and concrete walls and floors. To prepare surfaces for waterproofing, they hammer and chisel away rough spots or remove them with a rubbing brick before brushing on a coat of liquid waterproofing compound. They also may paint or spray surfaces with a waterproofing material or nail waterproofing fabric to surfaces. When dampproofing, they usually spray a coating of tar on interior or exterior surfaces.

## Working Conditions

Roofers' work is strenuous. It involves a lot of heavy lifting, as well as climbing, bending, and squatting. Roofers risk injuries from slips or falls from scaffolds, ladders, or roofs, and burns from hot bitumen. In fact, the accident rate in the roofing industry is the highest in all construction. Roofers work outdoors in all types of weather, particularly when making repairs. Roofs are extremely hot during the summer.

## Employment

About 113,000 roofers were employed in 1980. Most worked for roofing contractors on construction or repair jobs. Some worked for businesses and government agencies that do their own construction and repair work. About 3 out of every 10 roofers is self-employed.

## Training, Other Qualifications, and Advancement

The majority of roofers acquire their skills informally by working as helpers for experienced roofers. However, some train through 3-year apprenticeship programs administered by local union-management committees.

Helpers learn the trade on the job. They start by carrying equipment and material and erecting scaffolds. Within 2 or 3 months they are taught to measure, cut, and fit roofing materials such as felt. Soon, they are able to lay asphalt shingles. It can take 5 years or more to get experience installing all types of roofing materials, because some materials are not used frequently.

The apprenticeship program generally consists of a minimum of 1,400 hours of on-the-job training annually, in addition to 144 hours of classroom instruction in subjects such as tools and their use, arithmetic, and safety. On-the-job training for apprentices is similar to that for helpers, except that the apprenticeship is more structured. Apprentices also learn to dampproof and waterproof walls.

Good physical condition and a good sense of balance are essential. A high school education or its equivalent is helpful, as are courses in mechanical drawing and basic mathematics. Applicants for apprenticeship programs must be at least 18 years old.

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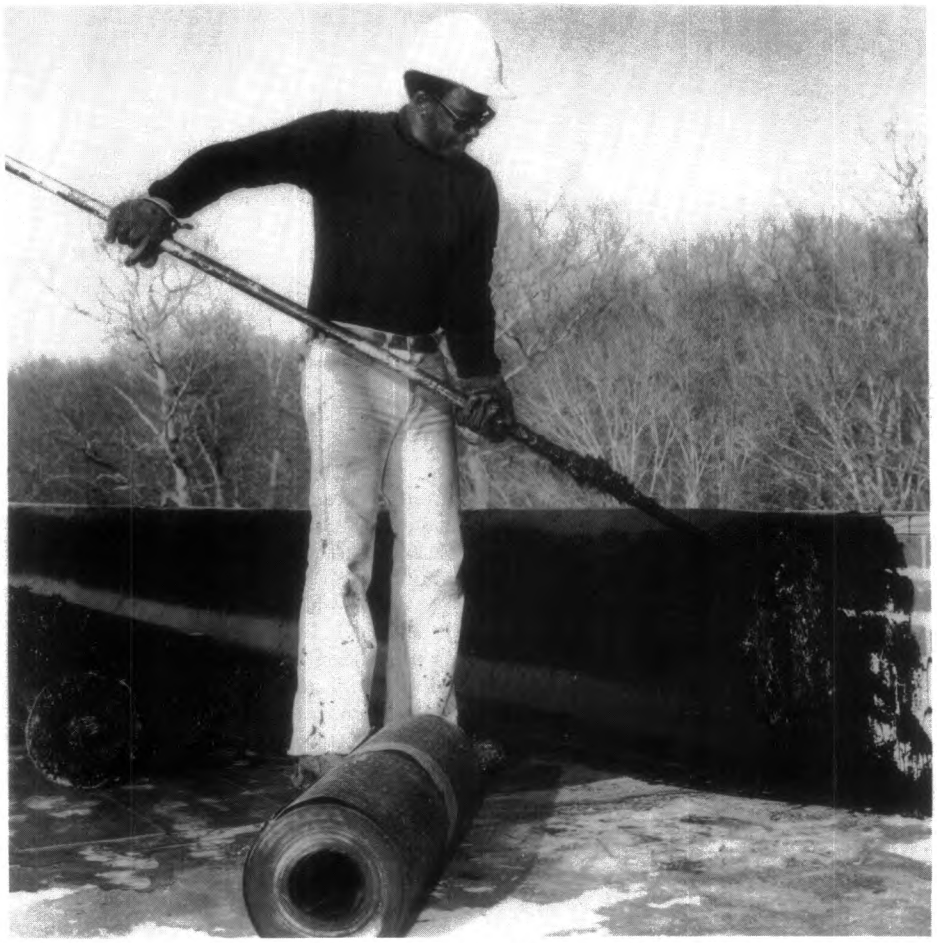

Roofers often work with hot, sticky substances such as tar.

Roofers may advance to supervisor for a roofing contractor; some become contractors themselves.

## Job Outlook

Employment of roofers is expected to increase as fast as the average for all occupations through the 1980's. The need to replace experienced roofers who transfer to other occupations, retire, die, or stop working for other reasons will result in many job openings. Jobs should be easiest to find during spring and summer when most roofing is done.

Buildings need new roofs about every 10 years. As the number of buildings in use grows, more roofers will be needed to do the additional reroofing work.

Roofing is less sensitive to general economic conditions than other construction occupations. Because reroofing accounts for most of the roofer's work, employment opportunities are not tied to the level of new construction, which tends to fall during economic downturns.

## Earnings

Union roofers in metropolitan areas had estimated average wages of $12.08 an hour in 1980. In comparison, the average hourly rate paid to nonsupervisory or production workers in private industry, except farming, was $6.66. Apprentices usually start at 55 percent of the skilled roofer's pay rate and receive increases every 6 months. Yearly earnings for roofers and apprentices, however, generally are lower than hourly rates would indicate because the annual number of hours they work can be adversely affected by poor weather and fluctuations in construction activity.

Many roofers are members of the United Union of Roofers, Waterproofers and Allied Workers.

## Related Occupations

Roofers cover and waterproof roofs using asphalt shingles, bitumen and gravel, or other materials. Workers in other occupations also cover surfaces with special materials for protection and decoration. These occupations include acoustical carpenters, composition-weatherboard appliers, dry-wall applicators and finishers, floor covering installers, glaziers, siding applicators, terrazzo workers, and tile setters.

## Sources of Additional Information

For information about roofing apprenticeships or work opportunities in this trade, contact local roofing contractors; a local of the union previously mentioned; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency.

For information about the work of roofers, contact:

National Roofing Contractors Association, 1515 N. Harlem Ave., Oak Park, Ill. 60302.

# Sheet-Metal Workers

(D.O.T. 619.260-008, -010 and 804.281-010, -014)

## Nature of the Work

Sheet-metal workers make, install, and maintain a variety of sheet-metal products for homes, and commercial and industrial buildings. These products include ducts for air-conditioning, heating, and ventilating systems, counter tops, roofs, siding, rain gutters, skylights, outdoor signs, and air vents. Some workers specialize in fabrication, installation, or maintenance; but most do all three jobs.

Sheet-metal workers fabricate many products at a shop away from the construction site. Working from blueprints or instructions from supervisors, they measure, cut, bend, shape, and fasten pieces of sheet metal to make duct work, counter tops, and other custom products. Workers use tapes and rulers for measuring sheet metal and laying out the work; hand shears, hack saws, and power saws for cutting; and specially designed, heavy steel presses and shears for cutting, bending, and shaping. They fasten the seams and joints together with bolts, cement, rivets, solder, or by welding.

At the construction site, sheet-metal workers assemble and install pieces fabricated at the shop. Workers also use hammers, shears, and drills to make parts by hand at the worksite and to alter parts made in the shop.

Workers install ducts, pipes, and tubes by joining them end to end and hanging them with metal hangers secured to a ceiling or a wall. To hold the pieces together, workers may bolt, weld, rivet, glue, or solder or use specially formed sheet metal.

Molded and pressed sheet metals, such as roofing and siding, usually are measured and cut on the job. After securing the first panel in place, workers interlock and fasten the grooved edge of the next panel into the grooved edge of the first. They nail or weld the free edge of the panel to the structure. This two-step process is repeated for each additional panel. Finally, at joints, along corners, and around windows and doors, workers fasten machine-made molding for a neat, finished effect.

Some sheet-metal workers specialize in testing, balancing, and adjusting existing air-conditioning and ventilation systems to make sure they are functioning properly.

## Working Conditions

Sheet-metal workers do considerable bending, lifting, standing, and squatting in close quarters or in awkward positions. They sometimes work high above ground. They also may get cuts and burns from materials and tools. Unlike many construction work-

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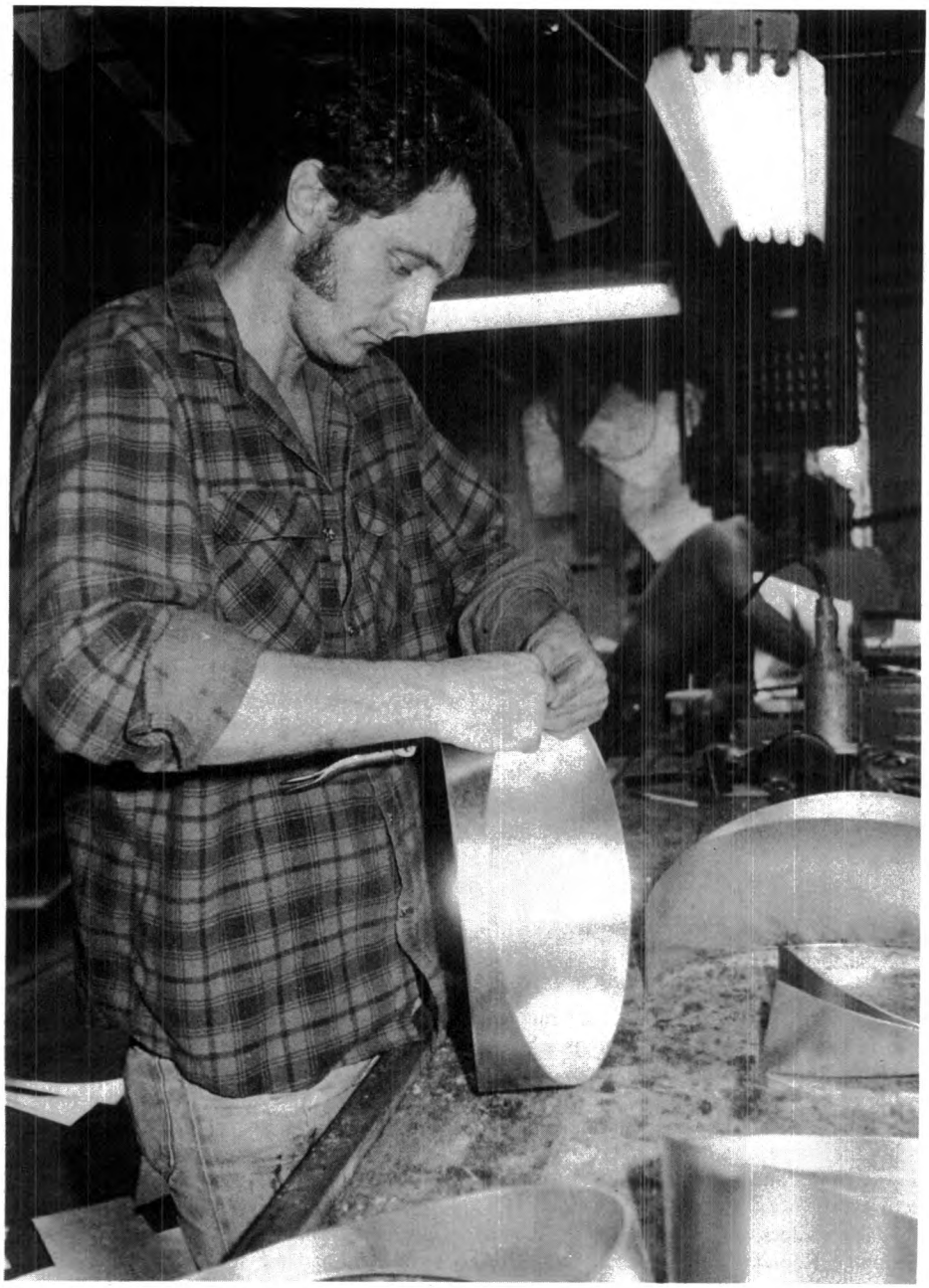

Many sheet-metal workers fabricate materials in shops off the construction site.

ers, sheet-metal workers generally do not lose work time because of bad weather since most work is done indoors.

## Employment

Sheet-metal workers in the construction industry—who numbered about 108,000 in 1980—are employed mainly by roofing, sheet-metal, and air-conditioning and heating contractors and by general contractors engaged in residential, industrial, and commercial building. Some sheet-metal workers are employed by government agencies or businesses that do their own construction and alteration work. Very few are self-employed. Sheet-metal workers are employed throughout the country, but jobs are concentrated in metropolitan areas.

## Training, Other Qualifications, and Advancement

Unlike many other construction workers, the vast majority of sheet-metal workers learn their trade through apprenticeship. Only a very small proportion acquire their skills informally on the job.

The apprenticeship program usually consists of 4 years of on-the-job training, and related classroom instruction. The programs are administered by joint committees of locals of the Sheet Metal Workers' International Association and local chapters of the Sheet Metal and Air-Conditioning Contractors' Association, or by local chapters of the Associated Builders and Contractors. The apprenticeship agreement guarantees a worker on-the-job experience in all aspects of the trade. Apprenticeship also is the best way to learn the mathematics needed for layout work.

On the job, apprentices use the tools, machines, equipment, and materials of the trade. They learn to measure, cut, bend, fabricate, and install sheet metal. They begin with duct work and gradually advance to more difficult jobs, such as making complex ducts, fittings, and decorative pieces. Toward the end of their training, they use materials such as plastics and acoustical tile, which may be substituted for metal on some jobs.

In the classroom, apprentices learn drafting, blueprint reading, trigonometry and geometry applicable to layout work, welding, and the principles of heating, air-conditioning, and ventilating systems. Safety is stressed throughout the program. In addition, apprentices learn the relationship between sheet-metal work and other construction work.

Workers who pick up the trade informally usually begin by carrying metal and cleaning up debris in a metal shop. While there, they learn about materials and tools and their uses. Then, as employers permit, helpers learn to set switches and operate levers on machines that bend or cut metal. In time, helpers leave the shop and go out on the job to learn installation.

Applicants for jobs as apprentices or helpers should be in good physical condition and have mechanical aptitude. Local apprenticeship committees and employers may require a high school or vocational school education. Courses in trigonometry, geometry, mechanical drawing, and shop provide a helpful background for learning the trade.

Sheet-metal workers in construction may advance to supervisory jobs or may go into the contracting business. Since a sheet-metal contractor must have a shop with equipment to fabricate products, this type of contracting business is more expensive to start than other types of construction contracting.

## Job Outlook

Employment of sheet-metal workers in construction is expected to increase about as fast as the average for all occupations through the 1980's. In addition to jobs created by increased demand for sheet-metal workers, many openings will arise as experienced workers leave the occupation, retire, or die.

More sheet-metal workers will be needed to install air-conditioning and heating duct work and other sheet-metal products in new houses, stores, offices, and other buildings. A growing demand for new, more energy-efficient air-conditioning and heating systems in existing buildings will boost employment opportunities for sheet-metal workers. Installation of solar heating equipment also will result in more job opportunities.

Although employment of sheet-metal workers is expected to increase over the long run, job openings may fluctuate somewhat from year to year due to change in economic condi-

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tions. However, employment of sheet-metal workers is less sensitive than employment of other construction workers to declines in new construction. Maintenance of existing sheet-metal equipment—which is less sensitive to economic fluctuations than new construction—makes up a large part of the work done by sheet-metal workers. Installations of new air-conditioning and heating systems also continue during construction slumps as individuals and businesses seek more energy-efficient equipment to cut utility bills.

People wishing to enter sheet-metal apprenticeships will face keen competition for positions because high wages and good training attract many people.

## Earnings

Hourly rates for union sheet-metal workers in large metropolitan areas averaged $13.07 in 1980. This was about twice the average for nonsupervisory workers in private industry, except farming. Sheet-metal apprentices generally start at 45 percent of the rate paid to experienced workers and may earn pay raises every 6 months during their apprenticeship.

A large proportion of sheet-metal workers are members of the Sheet Metal Workers' International Association.

## Related Occupations

Other occupations in which workers lay out and fabricate metal products include bench die makers, layout workers, machinists, metal fabricators, metal patternmakers, shipfitters, and tool-and-die makers.

## Sources of Additional Information

For more information about apprenticeships or other work opportunities, contact local sheet-metal contractors or heating, refrigeration, and air-conditioning contractors; a local of the union mentioned above; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or apprenticeship agency.

For general information about sheet-metal workers, contact:

Sheet Metal and Air Conditioning Contractors' National Association, Inc., 8224 Old Courthouse Rd., Vienna, Va. 22180.

Associated Builders and Contractors, 444 N. Capitol St., Suite 409, Washington, D.C. 20001.

# Tilesetters

(D.O.T. 861.381-054, -058, -062, and .684-018)

## Nature of the Work

In ancient Egypt and Rome, tile was used for the design and construction of mosaics—an art form using small, decorative ceramic squares. Today, in a fashion similar to that of the ancient artists, tilesetters apply tile to floors, walls, and ceilings.

To set tile, which ranges in size from 1/2 inch to 6 inches square, workers use either cement or mastic (a very sticky paste). When using cement, tilesetters first must tack a support of screen-like mesh to the floor, wall, or ceiling. They use a trowel to mix and spread a coarse cement onto the screen and a rake-like device to scratch the surface of the wet cement. After the cement has dried, workers trowel on a richer coat of cement which they work back and forth in sweeping motions until it is smooth and even.

To set tile in mastic, tilesetters need a flat, solid surface such as drywall, concrete, or wood. They use a tooth-edged metal trowel to spread the mastic and make tiny suction ridges to help hold tiles in place.

Since tile varies in color, shape, and size, workers sometimes prearrange tiles on a dry floor according to a specified design. This allows workers to examine the pattern and make any necessary changes.

Whether or not tiles are prearranged, tilesetters place each tile onto the cement or mastic. Some tiles are cut with a machine saw or a special cutting tool to fit into corners and around pipes, tubs, and wash basins. Once placed, tilesetters gently tap the tile surface with a small block of wood so all rest evenly and flatly.

When the cement or mastic has "set," tilesetters use a rubber trowel to cover the tile and joints with grout—a very fine cement. They then scrape the surface with a rubber-edge device called a squeegee to force grout from the face of the tile into joints and remove any excess. Before the grout dries, workers wash the surface with a damp sponge.

## Working Conditions

Tilesetters work indoors and are not exposed to the weather. Since most of the construction has been completed, the work area is relatively clean and uncluttered. Much of the workday is spent bending, kneeling, stooping, and reaching, activities that require endurance but not exceptional strength. To avoid sore knees or bad knees, some workers wear knee pads. Otherwise, typical construction work clothes are worn.

Although workers are subject to cuts from tools or materials, falls from ladders, and strained muscles, the occupation is not considered as hazardous as some other construction occupations.

## Employment

Tilesetters—who numbered about 20,000 in 1980—are employed mainly in nonresidential construction, such as schools, hospitals, and public and commercial buildings. About 1 out of 4 tilesetters is self-employed.

Tilesetters are employed throughout the country but are found largely in urban areas.

## Training, Other Qualifications, and Advancement

Most training authorities recommend completion of a 3-year apprenticeship program which generally consists of on-the-job training and related classroom instruction in subjects such as blueprint reading, layout, and basic mathematics.

Apprentices begin by learning the names of tools and how to use them. Within a short time they are taught to mix and apply cement and then to apply mastic. Later, they learn to cut and install tile.

A substantial proportion of tilesetters, however, acquire skills informally by working as helpers to experienced workers. They start by carrying supplies, cleaning work areas, and washing finished tile. Depending on the employer, a helper may learn to

Continued preference for tile in home construction will sustain demand for tilesetters.

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spread cement or mastic. Eventually, a helper is taught to cut and set tile.

When hiring apprentices or helpers, employers usually prefer high school or vocational school graduates who have had courses in general mathematics, mechanical drawing, and shop. Good physical condition, manual dexterity, and a good sense of color harmony also are important assets. Apprenticeship programs, while often recommended, may be more difficult to enter than other forms of training. In some locales, a written test and a physical examination are required.

Skilled tilesetters may become supervisors or start their own contracting businesses.

## Job Outlook

Employment of tilesetters is expected to increase faster than the average for all occupations through the 1980's. Although growth in demand for these workers will provide some new job opportunities, most will result from the need to replace tilesetters who retire, die, or leave the occupation for other reasons. Because tilesetting is a small occupation, however, there will be relatively few job openings annually.

Population and business growth are expected to cause an increase in the construction of houses and other buildings, and thus increase the demand for tilesetters. Continued preference for tile in kitchens and bathrooms and an expected increase in the use of tile in hallways and recreation areas of homes and other buildings—particularly in warmer regions of the country—will spur employment in this trade.

Employment of tilesetters, like that of many construction occupations, is sensitive to changes in the economy, particularly changes in the level of housing construction. Workers in this trade can experience periods of unemployment, particularly when homebuilding activity is down. On the other hand, temporary shortages of tilesetters may occur in some areas during peak periods of building activity.

## Earnings

According to a survey of union wages in cities with at least 100,000 inhabitants in 1980, hourly rates for tile layers averaged $12.25, compared with an average hourly rate of $6.66 for all nonsupervisory and production workers in private industry, except farming. Wage rates were generally highest in the West and lowest in the South. Hourly wage rates for apprentices start at about 50 to 60 percent of the rate paid to experienced workers and increase periodically.

The principal unions organizing workers in this trade are the International Union of Bricklayers and Allied Craftsmen; and the Tile, Marble, and Terrazzo Finishers and Shopmen International Union.

## Related Occupations

Tilesetters use their knowledge of tools and materials along with skill and dexterity to produce attractive, durable surfaces. Other workers requiring similar abilities include bricklayers, cement masons, marblesetters, stonemasons, stucco masons, and terrazzo workers.

## Sources of Additional Information

For details about apprenticeship or other work opportunities in this trade, contact local tilesetting contractors; locals of the unions previously mentioned; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of tilesetters, contact:

International Union of Bricklayers and Allied Craftsmen, International Masonry Apprenticeship Trust, 815 15th St. NW., Washington, D.C. 20005.

Tile, Marble, and Terrazzo Finishers and Shopmen International Union, Suite 116, 801 N. Pitt St., Alexandria, Va. 22314.

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# Extractive Occupations

The mining and petroleum drilling industries provide most of our Nation's fuels and raw materials. Oil and gas drilling supply fuel for transportation, manufacturing, and home heating. Metallic mining produces iron, copper, and silver for manufacturing. Quarrying furnishes limestone and gravel for building. And nonmetallic mining provides coal for generating electricity. The workers who drill for oil and gas, and mine metallic and nonmetallic ores comprise the extractive occupations. The following tabulation presents 1980 employment for a variety of these occupations.

| | |
|---|---|
| Roustabout | 80,000 |
| Rotary drill operator | 23,000 |
| Petroleum and gas derrick operator | 17,000 |
| Roof bolter | 13,000 |
| Oil well service operator | 12,000 |
| Mill and grinder operator | 12,000 |
| Continuous mining machine operator | 8,500 |

Workers use many kinds of drilling equipment for exploration and for production of oil, gas, and ores. Machine drillers set up and operate mobile drilling machines that bore holes for explosive charges. In a process called seismic prospecting, such charges are used to locate oil and gas deposits. Rotary drillers supervise the crew and operate the machinery that drill oil or gas wells. "Roughnecks" perform most of the manual work in these drilling operations, such as guiding pipe to and from the well opening. Clean-out drillers operate a truck-mounted hoist equipped with a derrick to clean out and prepare old oil wells for new production. Oil and gas are not the only materials produced by drilling, however. Auger machine operators run a drilling machine that bores coal out of seams lying near the surface.

Like drilling equipment, explosives have several uses in drilling and mining. Sample taker operators use explosives to obtain samples of the rocks in the sidewalls of oil wells. Oil well perforator operators explode charges in oil and gas wells to break blockages caused by drill pipes, casings, and rocks. Blasters use explosives in quarries to separate stone from quarry walls. In open pit copper mines, tier and detonator workers fracture the earth and rock above seams of ore with explosives.

Workers extract ore from mines using specialized machinery. Some machines cut material directly from the mine walls. Shale planer operators work a track-mounted machine that cuts shale from the mine wall and loads the shale onto a conveyor belt. Some machines perform only one step of the mining process. Cutter operators run machines that cut a channel under a coal seam. When explosive charges shatter the coal, it falls into the channel and is removed by loading machines.

Drilling and mining require many support services at the well or mine site. Shaft mechanics maintain the equipment that moves workers and machinery down underground-mine shafts. Roof bolters operate machines that install roof supports in underground mines. Safety lamp keepers repair the electric lamps used by underground miners. Without these services, drilling and mining could not proceed efficiently and safely.

Workers in extractive occupations usually learn their skills on the job. New workers are hired from the area around the wells and mines. Physical strength, stamina, and mechanical aptitude often are the most important traits sought by employers.

After receiving safety training, new workers are assigned to laborer jobs around the well or mine. Opportunities for training and promotion usually are based on seniority and ability to do higher level work. In many cases, union-management agreements set the rules governing training and promotion. Workers learn by doing the job under the supervision of experienced workers.

Advancement opportunities for extractive workers are limited. Some workers become supervisors; however, additional education is needed to advance to higher supervisory or management jobs.

More information on the work, training, and job opportunities for coal mining machinery operatives appears in the following statement.

## Coal Mining Operatives

(D.O.T. 850.638-018, .663-026, .683-010, and -030; 859.683-010 and -014; 921.663-050; 930.382-010, .482-010, .665-.010, .666-014, .683-010, and -014; 931.261-010; and 932.683-014)

### Nature of the Work

Coal has played a vital role in the industrial development of the United States. Coal was the primary source of the Nation's energy through the first quarter of this century, when it supplied 60 percent of the country's energy needs. For the next 50 years, use of coal fell as it was replaced by oil and natural gas that were cheaper, easier to handle, and cleaner to use. The rapidly rising price and uncertain supply of oil have resulted in the reemergence of coal as a major energy source.

Coal is extracted with complex and expensive machinery, such as power shovels that can remove 3,500 tons of earth in an hour and continuous mining machines that can rip 12 tons of coal from an underground seam in a minute. Operating these machines safely and efficiently is the work of coal mining machine operators.

There are several types of mining machinery operators. Their duties vary by the type of mine and the machinery they operate. Coal is mined from the surface or underground, depending on the depth and location of the coal seam and the geological formation around it. The following section describes the work of mining machinery operators at both surface and underground mines.

**Surface mines**. Surface mining requires removing the earth above the coal seam (overburden) and then digging out the coal.

*Bulldozer operators* (D.O.T. 850.683-010) remove trees, rocks, soil, and other obstructions from the mining area. *Machine drillers* (D.O.T. 930.382-010) then set up drilling machines to bore holes at points in the overburden selected by the blaster. While drilling, operators must avoid binding and stopping the drill. Drill operators may replace broken parts, change drill bits, and lubricate the equipment.

After the necessary holes have been drilled in the overburden, *blasters* (D.O.T. 931.261-010) set explosive charges in them. Blasters study the rock formation to determine where explosives should be located and how much should be used. After the charges are set, blasters detonate them and fracture the overburden.

*Stripping-shovel operators* (D.O.T. 850.663-026) and *dragline operators* (D.O.T. 850.683-018) control the shovels and draglines that remove the broken overburden to expose the coal. Bulldozer operators push rock and dirt within reach of the shovels and scoops.

When the overburden is removed, operators running smaller shovels remove the coal seam and load it into trucks. After the coal is mined, shovel and bulldozer operators replace the overburden, so the land can be reclaimed.

**Underground mining**. Underground mines are used to reach coal that lies deep below the surface. A series of entries are constructed so that workers and equipment can reach the coal. Three mining methods are used to extract the coal: Continuous, longwall, and conventional.

*Continuous mining* accounts for most of the coal produced underground. The heart of the system is the continuous mining machine, an electric, hydraulically operated machine that mines and loads coal in one step. Hydraulic lifts on the front of the machine support and spin cutting wheels that rip coal

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from the seam. Mechanical arms at the base of the machine gather the coal from the tunnel floor onto a conveyor. This belt moves the coal to a shuttle car or another conveyor belt for transportation out of the mine.

*Continuous mining machine operators* (D.O.T. 930.683-010) control this very productive and complex machine. Operators sit or lie in a cab at the rear of the machine. They move the machine to the mining area and manipulate levers that position the cutting wheels against the coal. Operators and their helpers may lubricate and adjust the machine and change cutting teeth.

*Longwall mining* is similar to continuous mining in that the coal is cut and loaded in one operation. The coal is cut from one wall that may be 300 to over 700 feet long. The mining machinery runs the length of this wall. A plow blade or cutting wheel moving along the wall shears the coal from the seam and automatically loads it onto a conveyor belt. The conveyor carries the coal to other conveyor belts or rail cars for transportation out of the mine. Steel canopies support the roof above the work area.

*Longwall mining machinery operators* (D.O.T. 930.665-010) advance the cutting device across the coal seam by manual or remote control. When using remote control, they observe lights and gauges on the control panel that signal problems with the machinery. Operators also listen for unusual sounds that indicate problems in the cutting and loading process. As the wall in front of the machine is cut away, the operator and helpers move the machinery and roof supports forward. The roof behind the supports then caves in. Longwall machinery operators also direct *tailers* (D.O.T. 930.666-014), who help run the machinery. Tailers adjust the depth of the cutting tool and signal the operator when it is properly positioned, help position the roof supports, and perform routine maintenance and minor repairs on the equipment.

*Conventional mining* differs from continuous and longwall mining because mining and loading are done in separate steps. The coal is blasted from the seam and then picked up for loading. Conventional mining also requires the most workers of the three underground methods.

*Cutter operators* (D.O.T. 930.683-014) run self-propelled machines equipped with a cutter 6 to 15 feet long. Operators drive these machines to the coal face and saw a channel along the bottom and sides of the coal to relieve pressure generated by the blast. *Drilling machine operators* (D.O.T. 930.482-010) control mobile drilling machines that bore holes into the coal. Blasters then set charges into the holes and detonate them to shatter the coal. After the blast, *loading machine operators* (D.O.T. 932.683-014) drive electric loading machines to the broken coal. Operators work levers that control the mechanical arms that scoop up the coal. Loading operators then automatically convey the coal onto shuttle cars or conveyors for transportation out of the mine.

## Working Conditions

Coal mining machine operators work under unusual and sometimes harsh conditions. At surface mines, operators work outside and may be exposed to bad weather. At underground mines, operators work in tunnels that may be cramped, dark, dusty, wet, and cold. At times, several inches of water may be on the tunnel floor. In both surface and underground mines, operators are exposed to loud noise from machinery. And, although much of the work is done by machines, the mine operator's job is physically demanding and dirty.

Since the passage of the Coal Mine Health and Safety Act in 1969, the coal industry has taken many steps to improve ventilation and lighting in underground mines and to eliminate safety hazards. Nevertheless, mining machine operatives must constantly be on guard against hazards. In both surface and underground mines, operators may be injured or killed in accidents involving mining machinery. In underground mines, operators face the additional hazards of roof falls or cave-ins, accumulation of poisonous and explosive gases, and exposure to coal dust. Workers exposed to coal dust over a period of years may develop pneumoconiosis (black lung), a disabling and sometimes fatal disease.

## Employment

In 1980, 58,000 mining machine operatives worked in the coal industry. The distribution of employment is presented in the following tabulation:

| | Percent |
|---|---|
| **Total** | **100.0** |
| Heavy-equipment operator | 55.8 |
| Continuous mining machine operator | 14.2 |
| Machine driller | 8.0 |
| Blaster | 6.2 |
| Loading machine operator | 6.1 |
| Cutting machine operator | 3.4 |
| Crane, derrick, and hoist operator | 3.1 |
| Longwall miner operator helper | 2.6 |
| Longwall miner operator | .6 |

Coal is mined in 26 States. However, employment is concentrated in the Appalachian area that includes West Virginia, Kentucky, Pennsylvania, and Virginia. Large numbers of coal miners also work in Ohio, Illinois, Alabama, and Wyoming.

Miner transports coal in a shuttle car from the mine face.

## Training, Other Qualifications, and Advancement

Coal mining operatives learn their skills on the job under the supervision of experienced workers. Federal laws require that all mine workers receive safety and health training before they begin work in the mine and annual retraining. Union contracts and some States also require preservice training and annual retraining in subjects such as first aid and health and safety regulations.

Miners must be at least 18 years old. Because the work is strenuous, they must be in good physical condition. A high school diploma is not required.

New, inexperienced mine workers, called "red hats," start as trainees and become general laborers after the initial training period. They perform routine tasks such as shoveling coal onto conveyor belts. As new miners gain experience, they work as helpers to experienced machine operators and learn the skills needed to operate the machinery. In

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union mines, when a vacancy occurs in a machine operator job, an announcement is posted and all qualified workers may apply for the job. The worker with the most seniority generally gets the position.

Advancement opportunities for coal mining operatives are limited. Some become supervisors; however, additional training is needed to advance to higher supervisory or management jobs.

## Job Outlook

Employment of coal mining operatives is expected to increase much faster than the average for all occupations through the 1980's in order to meet the rising demand for coal. In addition to the growth in demand for these workers, many openings will occur each year from the need to replace workers who leave the occupation, retire, or die.

Production of coal is expected to increase greatly over the next decade as the Nation seeks alternative sources of energy to imported oil. Electric utilities are the primary users of coal; as the price of oil increases relative to the price of coal, more utilities will switch to coal to fuel their powerplants. More coal also will be needed as manufacturing industries switch to coal-fired boilers and as the synthetic fuel industries, which use coal to produce oil and gas, are developed. In addition to domestic demand, coal exports are expected to rise as countries around the world strive to reduce their dependence on oil.

The employment outlook for individual operator occupations will depend on the types of new mines opened and the mining methods and machinery used. The increased use of surface mining will increase the demand for bulldozer operators, dragline operators, and power shovel operators. In underground mines, the demand for continuous mining machine operators and longwall miner operators should increase.

Coal is a major resource in the production of goods such as steel and cement. Because the demand for these goods is sensitive to changes in the level of economic activity, the demand for coal may decline during economic downturns. Miners may lose their jobs when the demand for coal drops.

## Earnings

Average hourly earnings for production workers in coal mining are higher than for the mining industry as a whole, and substantially higher than the average for all production workers in private industry, except farming. In 1980, coal miners averaged $10.83 per hour, compared to $9.18 for all miners and $6.66 for workers in private industry. Wage rates for mining machinery operatives are presented in table 1. Operatives who work the evening shift receive an additional $.20, an hour and those who work the night shift receive an additional $.30 an hour.

Hydraulic jacks support the roof as the coal is sheared from the face of a seam.

**Table 1. Average hourly earnings in selected occupations in the bituminous coal industry, 1980**

| Occupation | Hourly rate[1] |
|---|---|
| Power shovel operator | $10.66 |
| Longwall miner operator | 10.64 |
| Continuous mining machine operator | 10.57 |
| Continuous mining machine helper | 10.27 |
| Loading machine operator | 10.18 |
| Cutting machine operator | 10.16 |
| Cutting machine operator helper | 10.11 |
| Bulldozer operator | 10.03 |
| Blaster | 9.91 |
| Machine driller | 9.80 |

[1]Excludes overtime and incentive pay.

SOURCE: Bureau of Labor Statistics.

Virtually all coal miners get 10 holidays a year. Miners who work in mines covered by a contract between the Bituminous Coal Operators Association and the United Mine Workers receive 14 days of paid vacation a year. After working 6 years, these miners gain 1 extra vacation day each year up to a maximum of 13 extra days. Miners generally must take their vacation during 1 of 3 regular vacation periods. After 1 year on the job, however, miners receive 5 personal/sick and 4 floating vacation days that do not have to be taken during these periods. Miners not covered by the BCOA-UMW contract generally receive 2 weeks of paid vacation after 1 year of employment.

Most coal miners receive health and life insurance and pension benefits. Health insurance usually includes hospitalization, surgery, convalescent care, rehabilitation services, and maternity benefits. These benefits also extend to the miner's dependents. The size of a miner's pension depends on the age at retirement and the number of years of service.

The United Mine Workers of America negotiates the contracts that cover most coal miners. The Southern Labor Union, the Progressive Mine Workers, the International Union of Operating Engineers, and independent single-firm unions also have contracts with mine operators.

## Related Occupations

Many other workers are needed to run safe and efficient coal mines. These occupations include hoist operators, maintenance electricians, maintenance mechanics, rock dust sprayers, roof bolters, safety engineers, section supervisors, shuttle car operators, stripping shovel oilers, and truckdrivers.

## Sources of Additional Information

For details about job opportunities in mining, contact individual coal companies. General information on mining occupations is available from:

United Mine Workers of America, 900 15th St. NW., Washington, D.C. 20005.

National Coal Association, 1130 17th St. NW., Washington, D.C. 20036.

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# Production Occupations

Cars, gasoline, newspapers, eyeglasses, diamond rings, guided missiles and most other products have at least one thing in common—they are made by production workers. Most production workers are found in manufacturing plants, but others work in settings as different as shoe repair shops, movie theaters, jewelry stores, and meat markets.

There are thousands of production occupations. In many, workers do only one task in a process that mass produces a single product. A lens inserter, for example, fits lenses into eyeglass frames. In other production jobs, workers do a variety of tasks to produce many different goods. Instrument makers, for example, build precise measuring and regulating devices, completing all of the steps that are required to finish the devices. Some workers perform simple, repetitive operations on large machine tools while others—jewelers, for example—use hand tools to do delicate work. Not all production workers turn out products, however. Some operate complex systems of boilers, generators, pumps, and valves that produce clean water or energy.

Training requirements for production workers vary widely. Some workers who do repetitive tasks can learn their job in a few days. Other jobs require years of experience. Many production workers learn their skills through apprenticeship programs that combine classroom instruction with on-the-job training. Others receive training in public and private vocational schools and in the Armed Forces.

The occupational statements in this chapter describe in detail the work, training, and job outlook for 32 production occupations.

## Blue-Collar Worker Supervisors

### Nature of the Work

In any organization, someone has to be boss. For the millions of workers who assemble television sets, service automobiles, lay bricks, unload ships, or perform any of thousands of other activities, a blue-collar worker supervisor is the boss. These supervisors direct the activities of other employees and frequently ensure that millions of dollars worth of equipment and materials are used properly and efficiently. While blue-collar worker supervisors are most commonly known as foremen or forewomen, they also have many other titles. In the textile industry, they are referred to as second hands; on ships, they are known as boatswains; and in the construction industry, they are often called overseers, strawbosses, or gang leaders.

Although titles may differ, the job of all blue-collar worker supervisors is similar. They tell other employees what work has to be done and make sure the work is done correctly. For example, loading supervisors at truck terminals assign workers to load trucks, and then check that the material is loaded correctly and that each truck is fully used. They may mark freight bills and record the load and weight of each truck. In many industries, supervisors also direct all or part of a production process. Mine car dispatchers, for example, control the traffic of new coal through underground mines.

Because they are responsible for the output of other workers, supervisors make work schedules and keep production and employee records. They plan employees' activities and must allow for unforeseen problems such as absent workers and machine breakdowns. Supervisors teach employees safe work practices and enforce safety rules and regulations. They also may demonstrate timesaving or labor-saving techniques to workers and train new employees.

In addition to their other duties, blue-collar worker supervisors tell their subordinates about company plans and policies; recommend good performers for wage increases, awards, or promotions; and deal with poor performers by retraining them in proper methods, by issuing warnings, or by recommending that they be disciplined or fired. In companies where employees belong to labor unions, supervisors meet with union representatives to discuss work problems and grievances. They must know the provisions of labor-management contracts and run their operations according to these agreements.

### Working Conditions

Although working conditions vary from industry to industry, most blue-collar worker supervisors work in a normal shop environment. They may be on their feet much of the time overseeing the work of subordinates and may be subjected to the noise and grime of machinery.

Since these supervisors are responsible for the work of other blue-collar workers, they may work longer hours in order to be on the job before other workers arrive and after they leave.

First-line supervisors sometimes are caught in the middle between the work force and management. New supervisors who are hired from outside the firm also may face initial hostility from workers who feel they should have been promoted to the job. These potential problems are offset by the satisfaction that blue-collar worker supervisors may find in having more challenging and prestigious jobs than most blue-collar workers.

### Employment

About 1,300,000 blue-collar worker supervisors were employed in 1980. Although they worked for almost all businesses and government agencies, over half of them worked in manufacturing, supervising the production of cars, washing machines, and thousands of other products. Most of the rest worked in the construction industry, in wholesale and retail trade, in public utilities, and transportation. Employment is distributed in much the same way as population, and jobs are located in all cities and towns.

### Training, Other Qualifications, and Advancement

When choosing supervisors, employers generally look for experience, skill, and leadership qualities. Employers place emphasis on the ability to motivate employees, maintain high morale, command respect, and get along with people. Completion of high school often is the minimum educational requirement, and 1 or 2 years of college or technical school can be very helpful to workers who want to become supervisors.

Most supervisors rise through the ranks—that is, they are promoted from jobs where they operated a machine, worked on an assembly line, or at a construction craft. This work experience gives them the advantage of knowing how jobs should be done and what problems may arise. It also provides them with insight into management policies and employee attitudes towards these policies. Supervisors are sometimes former union representatives who are familiar with grievance procedures and union contracts. To supplement this work experience, many companies have training programs to help develop supervisory skills.

Although few blue-collar worker supervisors are college graduates, a growing number of employers are hiring trainees with a college or technical school background. This practice is most prevalent in industries with highly technical production processes, such as the aerospace, oil, and electronics industries. Employers generally prefer backgrounds in business administration, industrial relations, mathematics, engineering, or science. The trainees undergo on-the-job training until they are able to accept supervisory responsibilities.

Outstanding supervisors, particularly those with a college education, may move up to higher management positions. In manufacturing, for example, they may advance to



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jobs such as department head and plant manager. Some supervisors, particularly in the construction industry, use the experience and skills they gain to go into business for themselves.

## Job Outlook

Employment of blue-collar worker supervisors is expected to increase about as fast as the average for all occupations through the 1980's. In addition, many job openings will arise as experienced supervisors transfer to other occupations, retire, or die.

Rising incomes will stimulate demand for goods such as houses, air conditioners, TV sets, and cars. As a result, more blue-collar workers will be needed to produce these items, and more supervisors will be needed to direct their activities. Although most of these supervisors will continue to work in manufacturing, a large part of the increase in jobs will be in nonmanufacturing industries, especially in the trade and service sectors.

Because blue-collar worker supervisors are so important to the successful operation of a firm, they are often protected from layoffs during recession. Supervisors in the construction industry, however, may experience periodic layoffs, when interest rates cause construction activity to decline.

## Earnings

In 1980, average annual earnings of blue-collar worker supervisors who worked full time were about $21,000, approximately one and one-half times the average for all nonsupervisory workers in private industry, except farming. Supervisors usually are salaried. Their salaries generally are determined by the wage rates of the highest paid workers they supervise. For example, some companies keep wages of supervisors about 10 to 30 percent higher than those of their subordinates. Some supervisors receive overtime pay.

## Related Occupations

Many other workers have supervisory duties, including those who supervise professional and technical, sales, clerical, and service workers. Some of these are retail store or retail department managers; bank officers and head tellers; hotel managers, housekeepers, and assistants; postmasters and line supervisors; head cooks; head nurses; and surveyors.

## Sources of Additional Information

A bibliography of career literature on management occupations is available from:

American Management Associations, 135 West 50th St., New York, N.Y. 10020.

Blue-collar worker supervisors enforce safety regulations on the job site.

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# Precision Production Occupations

The workers discussed in this section of the *Handbook* produce goods that require a high degree of precision and must meet rigid quality standards. In addition, many of these workers must interpret very detailed instructions and specifications. Tool makers, for example, produce tools such as guides for drill presses that must be made to precise specifications because they are used to make hundreds or even thousands of identical parts. In order to do the job correctly, the tool maker must be able to read and follow exactly the blueprints provided by the tool designer.

Table 1 presents 1980 employment for selected precision production occupations.

**Table 1. Employment in selected precision production occupations, 1980**

| Occupation | Employment |
|---|---|
| Machinists | 303,000 |
| Machinist | 282,000 |
| Layout marker, metal | 21,000 |
| Tool-and-die maker | 166,000 |
| Compositor and typesetter | 128,000 |
| Cabinet maker | 71,000 |
| Tailor | 63,000 |
| Photoengraver and lithographer | 55,000 |
| Dental laboratory technician | 53,000 |
| Boilermaker | 44,000 |
| Metal molder | 40,000 |
| Furniture upholsterer | 35,000 |
| Jeweler and silversmith | 28,000 |
| Wood machinist | 26,000 |
| Furniture finisher | 22,000 |
| Shipfitter | 17,000 |
| Patternmaker | 17,000 |
| Shoe repairer | 16,000 |
| Watchmaker | 12,000 |
| Lens grinder | 11,000 |
| Coremaker | 9,000 |

SOURCE: Bureau of Labor Statistics.

There are no universal training requirements for these workers. Most precision production jobs can be learned informally—starting as a helper and observing experienced workers. Some companies offer in-house training programs on specific areas of the work. The preferred training for many of the more highly technical occupations—machinists, tool-and-die makers, and lithographers, for example—is completion of a formal apprenticeship program. These programs, which usually last from 3 to 5 years, combine classroom instruction with on-the-job training.

Job prospects for precision production workers vary widely. See the *Handbook* statements that follow for information on the job outlook in specific occupations.

## All-Round Machinists

(D.O.T. 600.260-018, -022, -026, -030, -034, -038, -042;.281-010,-018, -022; .381-018; and 714.281-018)

### Nature of the Work

All-round machinists are skilled metalworkers who can turn a block of metal into an intricate part, such as a gear or piston, that meets precise specifications. They know how to set up and operate most types of machine tools used to make metal parts for aircraft, cars, machines, and other equipment. They also know the working properties of metals such as steel, cast iron, aluminum, and brass used to make these parts. Using this knowledge of metals plus their skill with machine tools, production machinists plan and carry out the operations needed to make a machined product.

Before they begin work on a part, machinists usually consult blueprints or written specifications. They select tools and materials for the job and plan the cutting and finishing operations. To make a rifle barrel, for example, they might use alloy steel for the workpiece and a boring machine to cut out the rifle bore. After selecting a workpiece and the appropriate machine, they determine dimensions of work and machining computations. For example, they must know where to bore the hole in the workpiece, how fast they can feed the metal workpiece into the machine, and which cooling oils keep metal from overheating.

They use precision instruments, such as micrometers, to check their work to thousandths or even ten-thousandths of an inch. After completing machining operations, they may smooth rough metal edges before assembling the finished parts.

Like production machinists, all-round machinists in maintenance shops have a broad knowledge of metals, machines, and machining operations. These workers repair or make new parts for machinery. They also adjust and test these parts.

### Working Conditions

The work environment for machinists has improved considerably in recent years. Most machine shops are clean, well lighted, and well ventilated. Many modern shops are air-conditioned. Noise levels also have been reduced with the introduction of better designed machine tools. In shops where noise still is a problem, workers must wear earmuffs or earplugs to protect their hearing.

Working around high-speed machine tools, however, can still present certain dangers. Because flying pieces of hot metal can cause burns and cuts, machinists must wear safety glasses with side shields and other protective devices. Loose or billowy clothing, long hair, and rings or other jewelry are prohibited.

### Employment

About 303,000 persons worked as machinists in 1980. Almost every factory that uses substantial amounts of machinery employs all-round machinists to maintain its mechanical equipment. In some factories, machinists make large quantities of identical parts such as automobile axle shafts in production departments. In others, they make limited numbers of varied products such as missile motor cases in machine shops.

Most all-round machinists work in the following industries: Machinery, including electrical; transportation equipment; fabricated metal products; and primary metals. Other industries employing substantial numbers of these workers are the railroad, chemical, food processing, and textile industries. The Federal Government also employs all-round machinists in Navy yards and other installations.

Although machinists work in all parts of the country, jobs are most plentiful in areas where many factories are located. Among the leading areas of employment are Los Angeles, Chicago, New York, Philadelphia, Boston, San Francisco, and Houston.

### Training, Other Qualifications, and Advancement

A 4-year formal apprenticeship is the best way to learn the machinist trade, but some companies have shorter training programs for single-purpose machines. Many machinists do learn this trade on the job, however.

Persons interested in becoming machinists should be mechanically inclined to use the tools and machines required to build complex mechanisms. They also should be temperamentally suited to do highly accurate work that requires concentration as well as physical effort. Prospective machinists should be able to work independently. Although the work sometimes is tedious and repetitious, all-round machinists frequently have the satisfaction of seeing the final results of their work. They also often are able to switch from making one product to another; as a result, variety is a major feature of all-round machinists' work.

A high school or vocational school education, including mathematics, physics, or machine shop training, is desirable. Some companies require experienced machinists to


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take additional courses in mathematics and electronics at company expense to work with newer metalworking technologies, such as numerically controlled machine tools. In addition, equipment builders generally provide training in the electrical, hydraulic, and mechanical aspects of machine-and-control systems.

Typical machinist apprentice programs consist of approximately 8,000 hours of shop training and about 570 hours of related classroom instruction. In shop training, apprentices learn chipping, filing, hand tapping, dowel fitting, riveting, and the operation of various machine tools. In the classroom, they study blueprint reading, mechanical drawing, shop mathematics, and shop practices.

Many all-round machinists become supervisors. Others take additional training and become tool-and-die or instrument makers. Skilled machinists may open their own shops or advance into other technical jobs in machine programming and tooling.

## Job Outlook

The number of all-round machinists is expected to increase about as fast as the average for all occupations through the 1980's. Growth in the demand for machined metal parts will cause most of the increase. In addition, many openings will arise from the need to replace experienced machinists who transfer to other fields of work, retire, or die.

As population and incomes rise, so will the demand for machined goods, such as automobiles, household appliances, and industrial products. However, technological developments that increase the productivity of machinists are expected to keep employment from rising as fast as the demand for machined goods.

Chief among these technological innovations is the use of numerically controlled machine tools. These machines, which use computers to control various machining operations, significantly reduce the time for machining operations.

Much of the employment growth will occur in the maintenance shops of manufacturing plants as industries continue to use a greater volume of complex machinery and equipment. More skilled maintenance machinists will be needed to prevent costly breakdowns in highly mechanized plants. Often the breakdown of just one machine can stop an entire production line for hours.

Employment of machinists is relatively insensitive to the business cycle. Instead of being stimulated by demand for consumer goods, employment of production machinists is tied to the development of new industrial machinery. Even when demand for a particular consumer durable good is down—automobiles, for example—machinists are needed to retool in order to make new product lines.

Employment of machinists involved in plant maintenance also is insensitive to economic downturns. Proper maintenance and repair of costly equipment remain vital concerns even when production levels fall.

Machinists are highly skilled workers.

## Earnings

The earnings of machinists compare favorably with those of other skilled workers. Machinists employed in metropolitan areas had estimated average hourly earnings of $9.63 in 1980. Average hourly rates in 10 of the areas surveyed, selected to show how rates differ in various parts of the country, appear in the accompanying table. Because machinists' work is not seasonal, earnings are relatively stable year round. Many also receive numerous opportunities for overtime work.

**Table 1. Average hourly earnings of all-round machinists in selected areas, 1980**

| Area | Hourly rate |
|---|---|
| Milwaukee | $11.11 |
| Detroit | 11.00 |
| San Francisco–Oakland | 10.88 |
| Baltimore | 10.86 |
| New Orleans | 10.57 |
| Houston | 10.46 |
| Chicago | 10.02 |
| New York | 9.83 |
| Atlanta | 9.71 |
| Minneapolis–St. Paul | 9.65 |
| Boston | 8.65 |
| Jackson, Miss. | 7.29 |

SOURCE: Bureau of Labor Statistics.

Many machinists are members of unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the International Union of Electrical, Radio and Machine Workers; the International Brotherhood of Electrical Workers; and the United Steelworkers of America.

## Related Occupations

Occupations most closely related to all-round machinists are, of course, the other machining occupations. These include tool-and-die makers, machine tool operators, machine tool setup workers, and instrument makers. Other occupations that require precision and skill in working with metal include arc cutters, blacksmiths, gunsmiths, locksmiths, metal patternmakers, and welders.

## Sources of Additional Information

For information on career opportunities in the machine tool industry, contact:

The National Machine Tool Builders Association, 7901 Westpark Dr., McLean, Va. 22102.

Information on apprenticeship training, including recommended apprenticeship standards for tool-and-die makers certified by the U.S. Department of Labor's Bureau of Apprenticeship and Training can be obtained from:

The National Tool, Die and Precision Machining Association, 9300 Livingston Rd., Washington, D.C. 20022.

For information on apprenticeship training in the Chicago area, contact:

The Tool and Die Institute, 777 Busse Highway, Park Ridge, Ill. 60068.

Many local offices of State employment services provide free aptitude testing to persons interested in becoming all-round machinists or tool-and-die makers. In addition, the State employment service refers applicants for apprentice programs to employers. In many communities, labor-management apprenticeship committees accept applications for apprenticeship.

Apprenticeship information also may be obtained from the following unions (which have local offices in many cities).

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United Automobile, Aerospace and Agricultural Implement Workers of America, 8000 East Jefferson Ave., Detroit, Mich. 48214.

International Union of Electrical, Radio and Machine Workers, 1126 16th St. NW., Washington, D.C. 20036.

# Automobile Repair Service Estimators

(D.O.T. 620.261-014 and 018)

## Nature of the Work

Automobile repair service estimators are the link between customers and mechanics in many automobile dealerships and in some large independent garages. When customers bring their cars, vans, or light trucks into the service department, service estimators (sometimes called service advisors or writers) find out what work needs to be done and arrange for mechanics to do it.

For routine maintenance, service estimators make out a repair order listing the customer's name and address, make and year of the vehicle, mileage, and the work to be done. If a factory warranty covers the repairs, the service estimator also records the engine and body numbers, and date of purchase.

When customers offer only a sketchy description of the mechanical problem, the service estimator must question the customer and inspect or test drive the car, van, or pickup to diagnose the trouble. The estimator then prepares a repair order that describes the problem and its possible cause.

Service estimators tell the customer what repairs are needed, their approximate cost, and how long the work will take. Since this cannot always be done until mechanics have inspected the vehicles, estimators may phone later to give customers this information and to ask permission to do the work. Sometimes customers are reluctant to authorize expensive repairs even if they are necessary, so service estimators may describe how the work will improve performance and safety or prevent more serious trouble.

In large dealerships and shops, automobile repair service estimators give repair orders to the shop dispatcher who figures the cost of parts and labor and assigns work to mechanics. In smaller shops, however, estimators perform these duties. Service estimators also answer mechanics' questions about repair orders and often test drive vehicles after repairs have been made to be sure they are operating properly.

When the customer returns for the vehicle, the service estimator answers any questions about the repairs and settles complaints about their cost or quality. If the shop has made an error on the bill or failed to provide satisfactory service, the service estimator may adjust the bill, with permission from the service manager.

## Working Conditions

Most automobile repair service estimators work 40 to 48 hours a week. They are busiest, and often rushed, in the early morning when most customers bring in their vehicles, and in the late afternoon when they return to pick them up. Occasionally, service estimators must deal with irate customers.

Although service estimators must stand most of the day, their job is not physically strenuous. Occasionally, they must work outside in bad weather. Generally, however, they work in clean, well-lighted, and well-heated shops.

Auto repair service estimator explains charges to customer.

## Employment

About 11,400 persons worked as automobile repair service estimators in 1980. Most worked for large automobile dealers; some worked for large independent automobile repair shops. Repair shops with fewer than 20 employees usually do not employ service advisors. Most advisors are employed in metropolitan areas, where larger dealerships are located.

## Training, Other Qualifications, and Advancement

Automobile repair service estimators learn on the job under the guidance of experienced service estimators and the service manager. In many service departments, trainees begin by helping the shop dispatcher route work to mechanics, compute repair costs, and estimate the time required for different repairs. Beginners usually gain enough knowledge and experience in 1 to 2 years to handle most repair estimating jobs. In addition to on-the-job training, some estimators attend training programs conducted by automobile manufacturers.

When hiring persons for jobs as service estimator trainees, employers prefer high school graduates who are at least 21 years of age and who have had experience in motor vehicle repair or automotive training in high school, vocational or trade school, or community or junior college. Courses in commercial arithmetic, sales, public speaking, and English are helpful. Often employers fill these jobs by promoting mechanic trainees or parts-counter-worker trainees. Some firms prefer to hire experienced automobile mechanics.

Because most customers deal solely with the service estimator, employers seek persons who can win customer confidence and build repeat business. For this reason, applicants should be neat, courteous, even-tempered, attentive listeners, and good conversationalists.

Service estimators with supervisory ability may advance to shop supervisors or to service managers. Some open their own automotive repair shops or gasoline service stations.

## Job Outlook

Employment in this small occupation is expected to increase faster than the average for all occupations through the 1980's as the number of automobiles on the road grows. In addition to job openings arising from growth in demand for these workers, openings will arise to replace experienced service estimators who retire, die, or leave the occupation for other reasons. Employment of service estimators fluctuates relatively little with swings in the economy. Most automobile repairs cannot be deferred when budgets are strained during a recession. Even routine maintenance can only be delayed at the risk of accident or damage that will later require repair. In addition, during downswings people are more likely to repair older vehicles

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than to take on the much greater financial burden of buying a newer car, van, or pickup.

## Earnings

Service estimators employed by automobile dealers in 23 large cities had estimated average earnings of $8.43 an hour in 1980, more than 25 pecent higher than the average for all nonsupervisory workers in private industry, except farming. Many service estimators are paid a salary plus a commission, that is, a percentage of the cost of repairs or accessories their customers pay for. Others are paid a straight commission.

Some service estimators belong to the International Association of Machinists and Aerospace Workers; the Sheet Metal Workers' International Association; or the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.).

## Related Occupations

Workers in other occupations also diagnose problems with equipment, materials, or products. Examples are airplane inspectors, bridge inspectors, electrical inspectors, elevator examiners and adjusters, log scalers, railroad-car inspectors, water-quality testers, and way inspectors.

## Sources of Additional Information

Details on employment opportunities may be obtained from local automobile dealers or repair shops; locals of the unions previously mentioned; or the local office of the State employment service.

For general information about the work of automobile repair service estimators, write to:

Automotive Service Industry Association, 444 N. Michigan Ave., Chicago, Ill. 60611.

National Automobile Dealers Association, 8400 Westpark Dr., McLean, Va. 22102.

# Boilermaking Occupations

(D.O.T. 805.261-010,-014, .361-010, -014, .381-010 and 809.281-010)

## Nature of the Work

Boilers, vats, and other large vessels that hold liquids and gases are essential to many industries. Boilers, for example, supply the steam that drives the huge turbines in electric utility plants and ships. Tanks and vats are used to process and store chemicals, oil, beer, and hundreds of other products. Layout workers and fitters help make the parts for these vessels, and boilermakers assemble them.

*Layout workers* (D.O.T. 809.281-010) follow blueprints and templates in marking off lines, curves, holes, and dimensions on metal plates and tubes used to make the various parts of a boiler, vat, or tank. Markings must be planned and measured carefully, allowing for the curvature and thickness of the metal. Because errors in size or shape may be difficult or impossible to correct after the metal is cut, layout workers use instruments, such as compasses, protractors, gauges, and scales, to make precise measurements.

After other shop workers cut and shape the metal to specifications, *fitters* (D.O.T. 805.361-014) use bolts or temporary welds, called tackwelds, to hold the parts in place while they check to see that parts line up according to the blueprints. Fitters use grinders or cutting torches to remove excess metal, and welding machines to fill in small gaps. A new piece may have to be cut for large gaps.

Small boilers may be assembled at the plant where they are made; however, once the pieces for a larger boiler or tank have been cut out and checked for proper fit, they are transported to the shop or construction site for installation. There, *boilermakers* (D.O.T. 805.261-010,-014,.361-010) assemble and erect the vessels using rigging equipment such as hoists and jacks to lift heavy metal parts into place, and then weld or rivet the parts together. Because installation work must meet statutory safety standards, boilers are carefully tested for leaks and other defects.

Construction boilermakers also install auxiliary equipment on boilers and other vessels. For example, they install vapor barriers on open-top oil, gas, and chemical storage tanks to prevent fumes from polluting the air, and air pollution control equipment, such as precipitators and smoke scrubbers, in electric plants that burn high-sulfur coal.

Boilermakers also maintain and make repairs so that boilers remain safe and in good working condition. For example, when boilers occasionally develop leaks, boilermakers may dismantle the boiler, patch weak spots with metal stock, replace defective sections, or strengthen joints.

## Working Conditions

When laying out, fitting, assembling, or repairing boilers, workers often use potentially dangerous equipment, such as acetylene torches and power grinders, and handle heavy materials. Work may be done in cramped quarters inside boilers, vats, or tanks, which are often damp and poorly ventilated. Because workers occasionally work at great heights on top of large vessels, boilermaking occupations are more hazardous than many other metalworking occupations. To reduce the chance of injuries, many workers wear protective equipment, such as safety harnesses, safety glasses, and metal helmets.

## Employment

About 44,000 boilermakers, layout workers, and fitters were employed in 1980. About 4 of every 10 worked in the construction industry, mainly to assemble and erect boilers and other pressure vessels. Many boilermakers also were employed in the maintenance and repair departments of iron and steel plants, petroleum refineries, railroads, shipyards, and electric powerplants. Large numbers also worked for boiler repair firms and in Federal Government installations, principally in Navy shipyards and Federal powerplants. Layout workers and fitters worked mainly in plants that make fire-tube and water-tube boilers, heat exchangers, heavy tanks, and similar products.

## Training, Other Qualifications, and Advancement

Although many people have become boilermakers by working for several years as helpers to experienced boilermakers, most training authorities agree that a formal apprenticeship is the best way to learn this trade. Apprenticeship programs usually consist of 4 years of on-the-job training, supplemented by about 150 hours of classroom instruction each year in subjects such as blueprint reading, shop mathematics, and welding. Apprentices often have to travel if work is not available in their locality. If they are laid off, their apprenticeship will take longer than 4 calendar years to complete.

Most layout workers and fitters are hired as helpers and learn the craft by working with experienced employees. It generally takes at least 2 years to become a highly skilled layout worker or fitter.

When hiring apprentices or helpers, employers prefer high school or vocational school graduates. Courses in shop, mathematics, blueprint reading, welding, and machine metalworking provide a useful background for all boilermaking jobs. Most firms require applicants to pass a physical examination because good health and the capacity to do heavy work are necessary in these jobs. Mechanical aptitude and the manual dexterity needed to handle tools also are important qualifications.

Layout workers and fitters may become boilermakers or advance to shop supervisors. Boilermakers who become skilled in the practical and technical aspects of the trade may advance to *boilermaking supervisor* (D.O.T. 805.131-010). A few go into business for themselves.

## Job Outlook

Employment in boilermaking occupations is expected to increase about as fast as the average for all occupations through the 1980's. In addition to the jobs generated by increased demand, other openings will arise each year as experienced workers transfer to other fields of work, retire, or die.

The construction of many new electric powerplants will create a need for additional boilers and will cause employment of boilermakers, layout workers, and fitters to increase. The expansion of other industries that use boiler products, such as the chemical and

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petroleum refining industries, will further increase the demand for these workers.

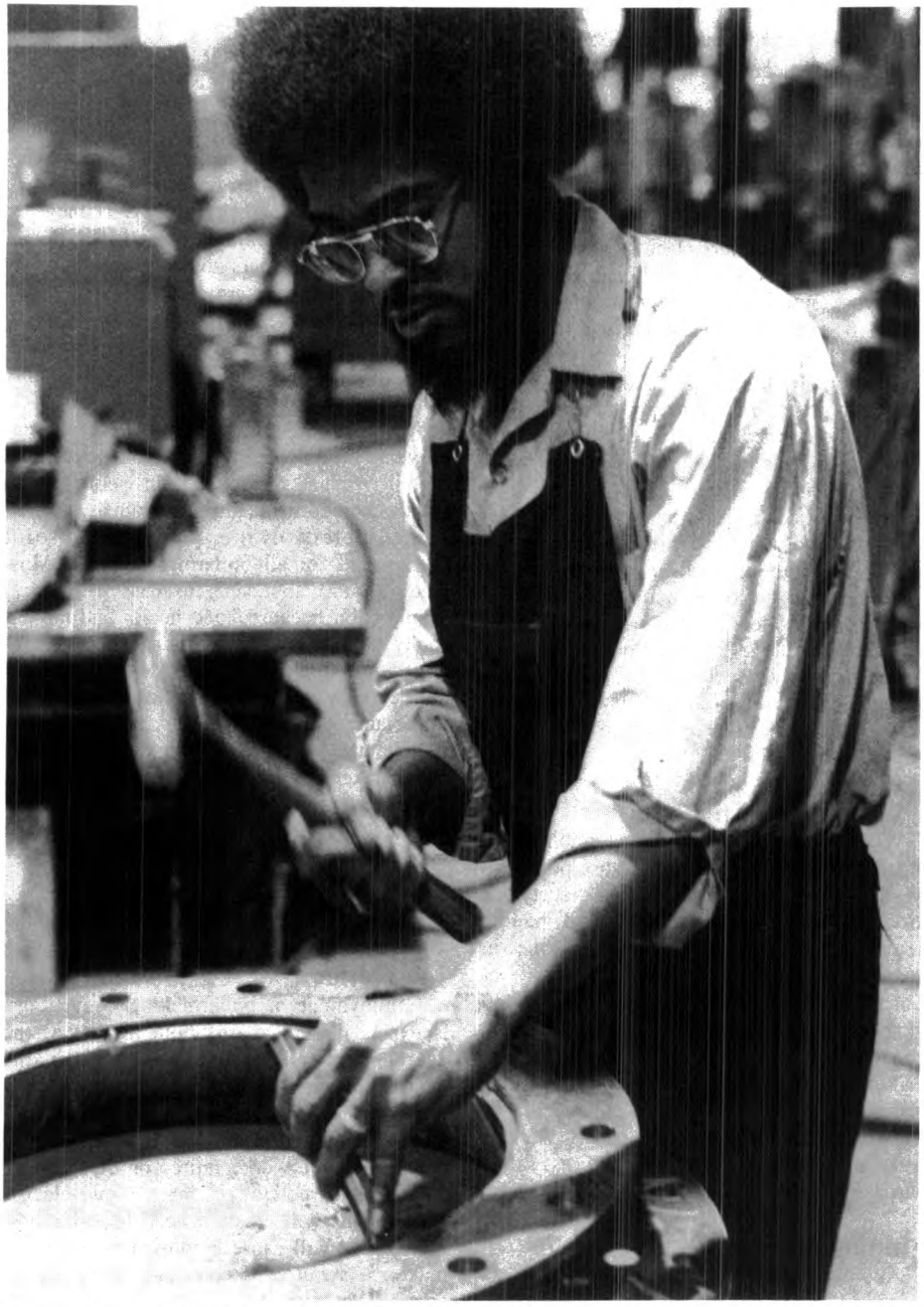
Despite the expected overall increase in employment, most of the industries that purchase boilers are sensitive to economic conditions. Therefore, during economic downturns some boilermakers, fitters, and layout workers may be laid off, and some may have to move from one area of the country to another to find employment.

## Earnings

According to a national survey of workers in the construction industry, union wage rates for boilermakers averaged $13.50 an hour in 1980. Annual earnings for boilermakers working in the building trades generally are lower than hourly rates would indicate because poor weather conditions and fluctuations in construction activity may adversely affect the number of hours they can work.

Comparable wage data were not available for boilermakers employed in industrial plants. However, hourly wage rates for many union boilermakers, layout workers, and fitters employed in fabricated plate work and in the petroleum and shipbuilding industries ranged from about $7 to $14 in 1980.

Most boilermaking workers belong to labor unions. The principal union is the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers. Other workers are members of the Industrial Union of Marine and Shipbuilding Workers of America; the Oil, Chemical and Atomic Workers International Union; and the United Steelworkers of America.



Boilermakers need mechanical aptitude and manual dexterity.

## Related Occupations

Workers in a number of other occupations assemble, install, or repair metal equipment or machines. These occupations include assemblers, blacksmiths, instrument makers, ironworkers, machinists, millwrights, patternmakers, plumbers, setup workers, sheetmetal workers, tool-and-die makers, and welders.

## Sources of Additional Information

For further information regarding boilermaking apprenticeships or other training opportunities, contact local offices of the unions previously mentioned, local construction companies and boiler manufacturers, or the local office of the State employment service.

# Bookbinders and Bindery Workers

(D.O.T. 653.360-010 through .686-026; 692.685-146; 794.687-026; 795.684-010, .687-010; 977.381-010, .684-010, -018, -022, and .687-010)

## Nature of the Work

Bookbinding—the assembly of books in quantity from large, flat printed sheets of paper—is one of the most complicated occupations of the printing industries. Skilled bookbinders (D.O.T. 977.381-010) operate machines that first fold the printed sheets into units, known as "signatures," so that the pages will be in the right order. They then insert any illustrations that have been printed separately, gather and assemble signatures in proper order, and sew them together. They shape the book bodies with presses and trimming machines and reinforce them with glued fabric strips. Covers are glued or pasted onto the book bodies, and then the books undergo a variety of finishing operations and frequently are wrapped in paper jackets. Machines are used extensively throughout the process. Many skilled bookbinders also are involved in magazine binding.

Bookbinders seldom perform all the different binding tasks, but many have had training in all of them. In large shops, bookbinders may be assigned to one or a few operations, most often to the operation of complicated machines, such as a large papercutter or a folding machine. When necessary, they make repairs and adjustments to bindery equipment.

In many binding shops, much of the work is done by bindery workers who are trained in only one operation or in a small number of relatively simple tasks. For example, semiskilled bindery workers perform such tasks as fastening sheets or signatures together using a machine stapler and feeding signatures into various machines for stitching, folding, or gluing operations.

Some bookbinders work in hand binderies, where they design original or special bindings for a limited edition or restore and re-

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bind rare books. This skilled work requires creative ability, knowledge of materials, and a thorough background in the history of binding. Hand bookbinding is perhaps the only kind of binding that gives the individual an opportunity to work at a variety of jobs.

## Working Conditions

The job is physically demanding as bookbinders do a considerable amount of lifting, standing, and carrying. Some large machines, such as cutting machines, require a great deal of physical effort to operate.

Bookbinders have some variety in their jobs, but the jobs of bindery workers tend to be monotonous.

## Employment

About 117,000 bookbinders and bindery workers were employed in 1980. Many worked in shops that specialize in bookbinding; others worked in the bindery departments of book printing firms, commercial printing plants, and large libraries. Some bookbinders worked for the Federal Government.

Most bookbinders are employed on a full-time basis; many bindery workers work part time or on a temporary basis.

Although bookbinders work in all parts of the country, employment is concentrated in large printing centers such as New York, Chicago, Washington, D.C., Los Angeles, and Philadelphia.

## Training, Other Qualifications, and Advancement

A 4- or 5-year apprenticeship, which includes on-the-job training as well as related classroom instruction, generally is required to qualify as a skilled bookbinder. Apprenticeship applicants usually must have a high school education, mechanical aptitude, and be at least 18 years of age. Apprentices receive training in all phases of bookbinding, such as renovating old and worn bindings and operating bindery equipment and cutting and trimming machines. In most plants, bookbinders are taught to operate and maintain at least three different pieces of bindery equipment.

Most bindery workers learn their tasks through informal on-the-job training that may last from several months to 2 years. A large number, however, learn through formal apprenticeship programs that include classroom instruction as well as on-the-job training.

High school students interested in bookbinding careers should take shop courses to develop their mechanical skills. Accuracy, patience, neatness, and good eyesight are among qualities needed by bookbinders. Good finger dexterity is essential for those who count, insert, paste, and fold. Artistic ability and imagination are required for hand bookbinding.

Advancement opportunities generally are limited. In large binderies, skilled bookbinders with considerable experience may advance to supervisors.

## Job Outlook

Little or no change in the employment of bookbinders and bindery workers is expected through the 1980's. Nevertheless, some job openings will arise as workers retire, die, or change occupations.

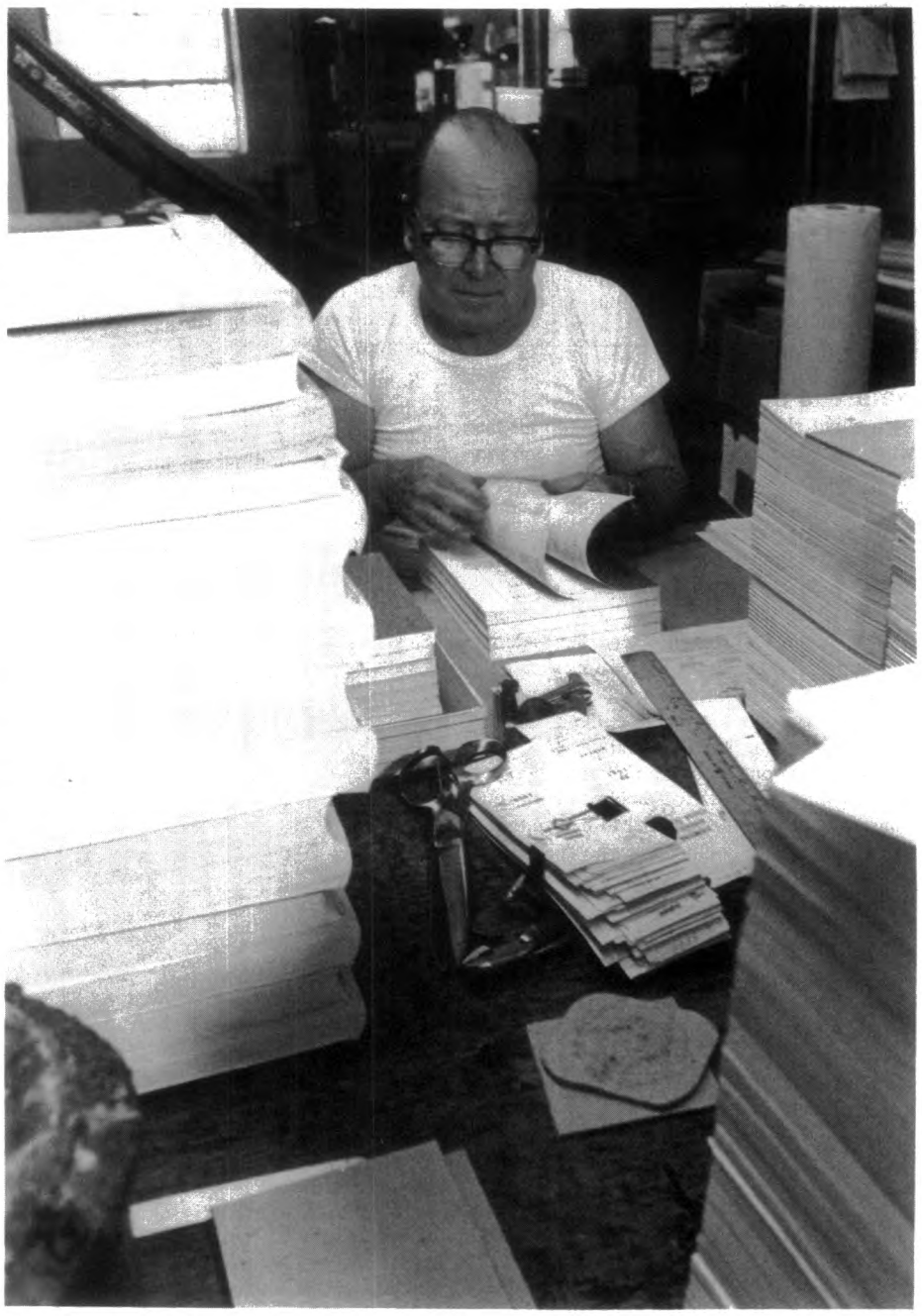
Despite the anticipated increase in the amount of bound printed materials, employment growth will be limited by the increasing mechanization of bindery operations. For example, the use of integral folders that automatically fold pages as they come off the press eliminates the need for bindery workers to do the folding by hand. In addition, many binderies are installing sophisticated conveyor belt systems to transport materials. This equipment also will reduce the need for bindery workers.

Job opportunities, therefore, are expected to be better for skilled bookbinders than for bindery workers. But because of the relatively small number of hand bookbinderies, opportunities in this field are expected to be limited.

## Earnings

Average wage rates for skilled bookbinders are below the average for other printing crafts. A 1980 survey of union wage rates indicated that minimum wage rates for bookbinders in publishing firms and book-binding shops averaged $10.05 an hour. In 1980, the average hourly rate for all nonsupervisory and production workers in private industry, except farming, was $6.66.

Wage rates for bindery workers are considerably lower than the rates for bookbinders,



Many bindery workers have part-time or temporary jobs.

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and are among the lowest for printing industry workers. The average minimum hourly rate for bindery workers was $7.07 in 1980.

### Related Occupations

Other workers who set up and operate production machinery include papermaking machine operators, press operators, and precision machine operators.

### Sources of Additional Information

Details about apprenticeships and other training opportunities may be obtained from local bookbinding shops, local offices of the Graphic Arts International Union, or the local office of the State employment service.

For general information on bookbinding occupations, write to:

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

Graphic Arts International Union, 1900 L St. NW., Washington, D.C. 20036.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22201.

## Compositors

(D.O.T. 203.582-046, -062; 650.582-010, -014, -018, -022, .682- 010, .685-010; 654.382-010, .582-010; and 973.381-010)

### Nature of the Work

In small shops, one person may do all the work needed to complete a printing job. In large shops, however, the work is divided among specialists. Editors select the material to be printed, while compositors prepare preliminary printing plates for pressroom workers who do the actual printing.

After deciding what is to be printed and how it should look, editors send the material or "copy" along with a list of specifications to the composing room. There, a composing room supervisor reviews the editor's specifications and marks the manuscript with instructions about the style and size of type, column width, and size of pictures or illustrations. The copy—the material to be printed—then is given to a compositor who specializes in typesetting either by "hot type," "cold type," or photocomposition.

There are several ways of setting and producing printed material. *Hand compositors* make up the oldest composing room occupation but exist only in "hot type" operations. Today, hand typesetting is used rarely except for small specialty jobs in which the setting of type by machine is impractical. Hand typesetters read from the copy and set each line of type, letter by letter, on a "composing stick," a device that holds type in place. They select the place where words will be divided and a hyphen placed (hyphenation), if the word does not fit on a line, as well as adjust the spacing of the type with pieces of metal so that the line of type will be the width of the column. As each "stick" is filled, they slide the completed lines into a shallow metal tray called "galley."

Linotype and monotype machine operators are craft workers who operate semiautomatic machines that set type much more rapidly than can be done by hand methods.

*Linotype machine operators* read from copy clipped to the machine and operate a keyboard to select letters and other characters. As they press the keys, metal molds of the letters are assembled into lines of words. After completing a line, operators touch a lever and the machine automatically fills the molds with molten lead, forming a line of type into a solid metal strip called a "slug." The slugs are assembled into the type frames from which printing plates are made.

*Monotype keyboard operators* also operate a keyboard machine. However, instead of selecting metal molds, the monotype machine produces a perforated paper tape. These operators feed the tape into a machine that reads the tape and automatically selects metal molds for each letter. The machine then forces molten metal into each mold to form the type.

While machines make their tasks easier, monotype and linotype machine operators must hyphenate and adjust type spacing to fit the width of columns. In small plants, operators also may maintain and repair typesetting machines.

Some typesetting will continue to be done by hand or with monotype and linotype machines. However, more and more firms are using phototypesetting machines, which can set type much more rapidly than linotype or monotype machines. With this equipment, a photographic process replaces the casting of type and the final product is a photographic film of the type rather than a metal slug.

In a common type of phototypesetting, a *phototypesetter* types in the text without regard to column width or hyphenation and produces a magnetic or perforated paper tape. The operator then feeds the tape containing the text into a computer that is programmed to do hyphenation and create columns of text. The computer creates a second tape—containing the text as it will appear when printed—that phototypesetters insert into a photocomposition machine. This machine displays the individual characters on the tape and photographs them. The phototypesetter then develops films of the material to be printed.

The most advanced method of typesetting uses electronic phototypesetting equipment. With this equipment, an operator uses a keyboard to select the size and style of type, to select the column width, and to provide spacing instructions, as well as to store each character in a computer. The computer then displays columns of type on a screen that is similar to a TV picture tube. Operators visually check the text and make any required corrections. The information is then transmitted to a phototypesetter which produces a film of the material. These machines can prepare entire pages of type and provide space for any pictures that are to accompany the text.

After the copy is set, typesetters pass it to other compositors who arrange the columns of type, pictures, and illustrations according to the layout for each page submitted by the editor. If letterpress printing equipment is being used, they assemble the metal type and photoengravings in a large metal frame that clamps all the pieces together. If lithographic film equipment is being used, they cut the film of type and pictures and tape the pieces in place.

Compositor doing layout work.

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After arranging all the pages of a particular job in proper sequence, compositors make page proofs to review the entire job. Page proofs are checked with the original copy for errors and returned to the editor for final changes. After final changes have been put into the type, the plate is sent to the pressroom where production printing plates are made.

## Working Conditions

Hand compositors are on their feet most of the time and do some heavy lifting. Typesetting machine operators sit for long periods of time. Monotype and linotype machines are very noisy.

All compositors may be required to work overtime to meet publication deadlines; some regularly work evening or night shifts. Compositors employed by newspapers may work holidays and weekends.

## Employment

About 128,000 workers were employed as compositors in 1980. About two-fifths worked for newspaper plants. Many others worked for commercial printing plants, book and magazine printers, and Federal, State, and local governments. Some worked for banks, insurance companies, advertising agencies, manufacturers, and other firms that do their own printing.

Composing room workers are located in almost every community throughout the country, but they are concentrated in large printing centers such as New York, Los Angeles, Washington, D.C., Philadelphia, and Chicago.

## Training, Other Qualifications, and Advancement

In the past, almost all compositors were trained through some type of apprenticeship program. However, in recent years, the introduction of new technology has reduced the demand for all-round skilled compositors. As a result, more and more compositors are bypassing the traditional apprentice approach and are learning the work on the job. In addition, many firms are small and thus cannot afford the time and money to develop formal training programs.

In large companies, persons who want to become all-round compositors generally are trained through an apprenticeship program. Most of these programs emphasize training in the operation of phototypesetting machines and in photocomposition work. Generally, apprenticeship covers a 4-year period of training, supplemented by classroom instruction or correspondence courses. However, this period may be shortened by as much as 2 to 2½ years for apprentices who have had previous experience or schooling or who show the ability to learn the trade more rapidly.

Applicants for apprenticeship generally must be high school graduates and in good physical condition. They usually are given aptitude tests. Important qualifications include training in mathematics and English, especially spelling. Printing and typing courses in vocational or high schools are good preparation for apprenticeship applicants, and a general background in electronics and photography is becoming increasingly useful. Many technical institutes, junior colleges, and colleges offer courses in printing technology which provide a valuable background for people who are interested in becoming all-round compositors.

Persons with good typing skills can learn to be phototypesetting machine operators in a relatively short period of time. These workers need not be trained as skilled compositors, but they must be familiar with printing terms and measures.

In recent years, many monotype and linotype operators have been retrained as phototypesetting operators.

Manual dexterity and the ability to pay attention to detail and to work independently are important qualities for a compositor in layout work.

## Job Outlook

In spite of the anticipated expansion in the volume of printing, employment of compositors is expected to decline through the 1980's as high-speed phototypesetting machines and typesetting computers increasingly displace the traditional hot-metal method of typesetting which requires more operators. As a result, the few job opportunities that occur for monotype and linotype operators will result from the need to replace experienced workers who retire, die, or change occupations. Persons who can operate phototypesetting machines should have the best job prospects. Laborsaving developments in printing technology are expected to have the greatest impact on the employment of compositors by newspapers. Thus, employment prospects will be somewhat better for compositors in commercial shops.

For the jobs that do become available, opportunites should be best for persons who have completed post-high school programs in printing technology, such as those offered by technical institutes and junior colleges. Many employers prefer to hire applicants who have completed these programs because the comprehensive training they receive helps them learn composing room trades and adapt to new processes and techniques more rapidly.

Although most job opportunities will continue to be in the printing industry, a growing number will be found in other industries, such as paper and textile mills, which are doing their own typesetting instead of contracting it to printing firms.

## Earnings

According to a 1980 survey of union wages, the estimated average minimum hourly rate for hand compositors was $10.45 and machine operators, $10.79. In 1980, the average hourly rate for nonsupervisory and production workers in all private industries, except farming, was $6.66.

## Related Occupations

Other occupations in which workers operate machines equipped with a typewriter-like keyboard include clerk-typists, computer terminal system operators, keypunch operators, and telegraphic-typewriter operators.

## Sources of Additional Information

Details about apprenticeship and other training opportunities may be obtained from local employers such as newspapers and printing shops, the local office of the International Typographical Union, or the local office of the State employment service.

For general information on composing room occupations, write to:

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22209.

# Coremakers (Foundry)

(D.O.T. 518.381-014,.685-014,-018 and-022)

## Nature of the Work

Foundry casting is a process that forms metal into intricate objects by pouring molten metal into carefully prepared molds and allowing it to harden in the shape of the mold cavity.

Many cast metal products—pipefittings, automobile engine blocks, and electric powerplant equipment, for example—are hollow. Coremakers prepare the "cores" that are placed in molds to form the hollow sections in these castings. The poured metal hardens around the core, so that when the core is removed the desired cavity or contour remains.

A core may be made either by hand or by machine. In both instances, a specially prepared sand is packed into a core box made of wood, plastic, or metal in which a cavity of the desired size and shape has been formed. When hand methods are used, the coremaker uses rammers and other handtools to pack sand into the core box. The core then is removed from this box and is hardened by baking or by another drying method. Small cores are made on the workbench by *bench coremakers* (D.O.T. 518.381-014) and large ones are made on the foundry floor by *floor coremakers* (D.O.T. 518.381-014).

*Machine coremakers* (D.O.T. 518.685-014, -018, -022) operate machines that make sand cores by blowing or dumping sand into a core box. Some machine coremakers are required to set up and adjust their machines and do finishing operations on the cores.

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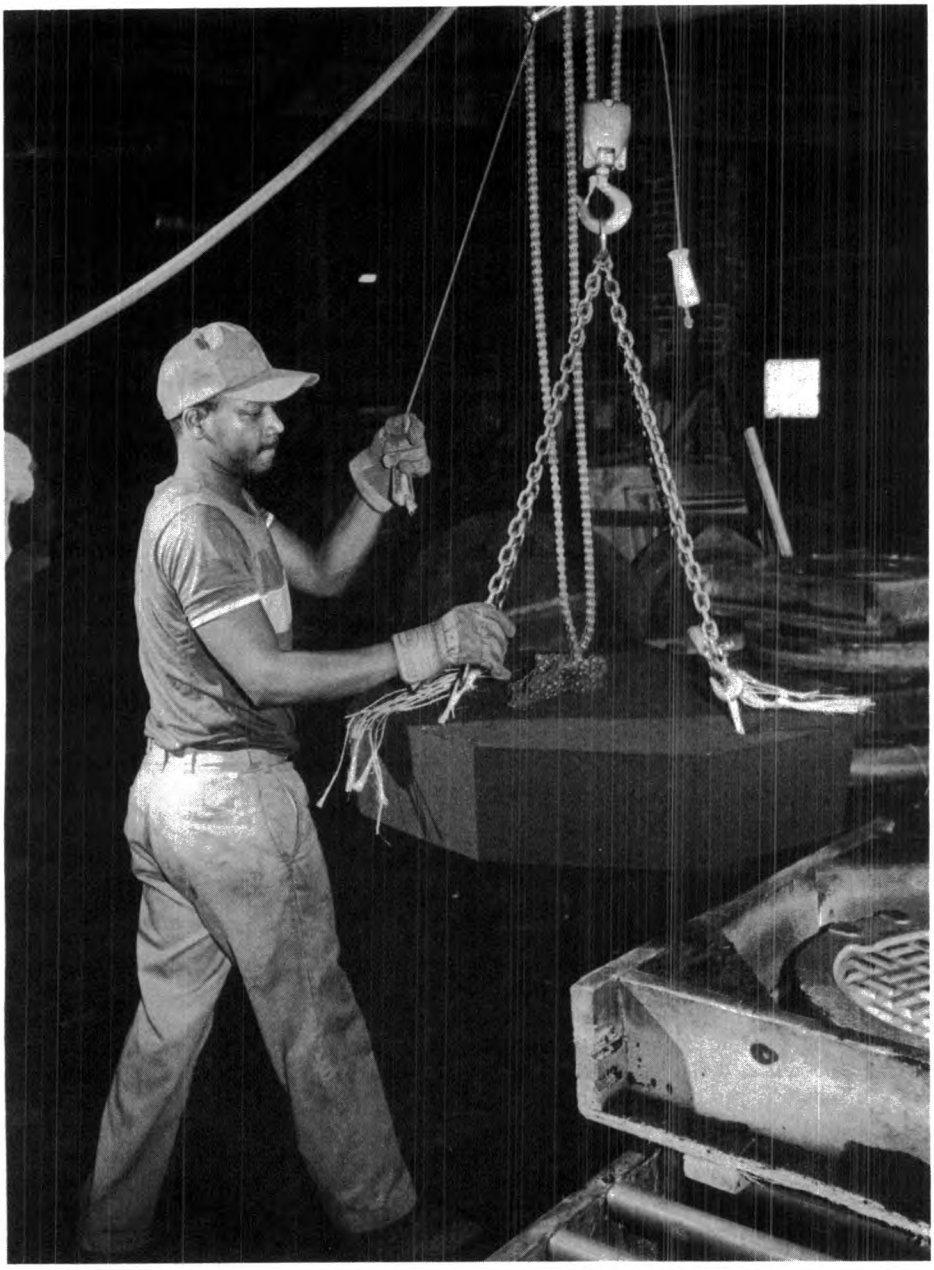

Coremakers prepare the "cores" that form the hollow sections of industrial equipment.

Others are primarily machine tenders and are closely supervised, and their machines are adjusted for them.

Other workers who have an important role in the foundry metalcasting process are molders and patternmakers. For a description of these jobs, see those statements elsewhere in this section.

## Working Conditions

Working in a foundry can be hazardous. Although the injury rate in foundries is higher than the average for manufacturing, coremaking is one of the least hazardous foundry jobs. Safety programs at many foundries and the use of personal protection equipment, such as metal-plated shoes and safety glasses, have reduced injuries.

Working conditions vary considerably from one foundry to another. Heat, fumes, and dust have been greatly reduced in many plants by the installation of improved ventilation systems and air-conditioning. However, in some older foundries, these hazards still exist.

## Employment

In 1980, about 6,200 coremakers were employed in the foundry industry. Most of them worked in small shops that employed fewer than 250 people. Although foundries are located throughout the country, the largest are concentrated in areas that have ready access to raw materials. States that have considerable metalworking production include Michigan, Ohio, Pennsylvania, Illinois, Indiana, Alabama, New York, California, and Wisconsin.

## Training, Other Qualifications, and Advancement

Completion of a 2- to 4-year apprenticeship program, or an equivalent amount of job experience, is needed to become a skilled hand coremaker. Apprenticeships generally are sponsored jointly by the employer and the International Molders' and Allied Workers' Union. They include classroom instruction covering subjects such as shop mathematics and the properties of metals, supplemented by on-the-job training. Coremaking and molding skills are often combined into one apprenticeship program.

In general, machine coremakers learn their work on the job. The length of training varies by individual and foundry, but generally is less than the time required for hand coremakers. Experienced coremakers teach beginners how to make cores and operate ovens. An eighth grade education usually is the minimum requirement for coremaker trainees; however, many employers prefer high school graduates.

Coremakers must stand for long periods and must move about frequently. The work requires manual dexterity. They also must be comfortable working with machinery. Coremakers earn higher pay as their skill increases, and some may advance to supervisory positions.

## Job Outlook

Although the production and use of metal castings are expected to increase substantially, employment of coremakers is expected to increase more slowly than the average for all occupations through the 1980's, as the growing use of machine coremaking will allow large increases in production with only moderate increases in employment. Some job openings will result from the need to replace experienced coremakers who transfer to other occupations, retire, or die. The number of openings may fluctuate greatly from year to year because the demand for many foundry products is sensitive to changes in the economy. Textile machinery and motor vehicle manufacturing industries, for example, use metal castings. When demand slackens for the products of these industries, as usually happens during recessions, demand for metal castings also falls. Thus, coremakers may experience layoffs or shortened workweeks when economic conditions are poor.

## Earnings

In January 1980, average straight-time hourly earnings of floor coremakers ranged from $6.70 in iron and nonferrous foundries to $6.90 in steel foundries, according to a wage survey made by the National Foundry Association. Bench coremakers averaged $6.30 in iron foundries and $6.70 in steel and nonferrous foundries. Machine coremakers averaged from $6.50 in nonferrous foundries to $7.10 in iron foundries. By comparison, production workers in all manufacturing industries averaged $7.27 an hour. Coremakers who were paid on an incentive basis generally had higher earnings than those who were paid a straight hourly wage.

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## Related Occupations

Other workers who must know how to make cores, set them in molds, or operate coremaking machines are core setters, coremaking machine setters, pipe coremakers, mold closers, core inspectors, and coreroom foundry laborers.

## Sources of Additional Information

For details about training opportunities for coremakers, contact local foundries, the local office of your State employment service, the nearest office of the State apprenticeship agency, or the Bureau of Apprenticeship and Training, U.S. Department of Labor. Information also is available from:

International Molders' and Allied Workers' Union, 1225 E. McMillan St., Cincinnati, Ohio 45206.

Additional career guidance material—free when requested on stationery with a school letterhead—is available from:

American Foundrymen's Society/Cast Metals Institute, Golf and Wolf Rds., Des Plaines, Ill. 60016.

# Dental Laboratory Technicians

(D.O.T. 712.281-010 and .381-014, -018, and -030)

## Nature of the Work

Dental laboratory technicians are skilled craftworkers who make and repair a wide variety of dental appliances, such as dentures, inlays, crowns, and braces. All work is done according to written instructions submitted by the dentist. Technicians work with plastics, ceramics, and metals. They use models of dental stone or plaster pourings made from impressions of a patient's teeth or mouth taken by the dentist. Sometimes these models are made by the dentist or an assistant, but most often by the technician.

Most technicians specialize. For example, a *denture contour wire specialist* (D.O.T. 712.381-014) makes and repairs contoured wire frames and retainers for teeth used in dentures; a *dental ceramist* (D.O.T. 712.281-010) applies porcelain paste over a metal framework to form dental crowns, bridges, and tooth facings; an *orthodontic technician* (D.O.T. 712.381-030) makes appliances for straightening teeth; and some technicians fabricate and repair full and partial dentures.

Trainees in beginning jobs usually mix and pour plaster into casts and molds and perform other simple tasks. As they gain experience, they do more difficult laboratory work. Some dental technicians perform the full range of laboratory work. Others are specialists who make crowns and bridges, arrange artificial teeth on dental appliances, make plastic molds for dentures, work with dental ceramics (porcelain), or make castings of gold or chrome metal alloys. Technicians use small hand instruments such as wax spatulas and wax carvers, as well as special electric lathes and drills, high-heat furnaces, metal-melting torches, and other specialized laboratory equipment.

## Working Conditions

Whether they are employed in independent commercial laboratories or in dental offices, dental technicians work in typical laboratory surroundings. Work areas are generally clean, well lighted, and well ventilated. Technicians usually have their own workbenches which are equipped with Bunsen burners, grinding and polishing machines, and various handtools. The work is not strenuous, and although there may be pressure to meet schedules, dentists' deadlines usually are flexible enough to allow for any problems or special requirements that may be involved in completing a difficult job.

Salaried technicians usually work 40 hours a week but self-employed technicians frequently work longer hours.

## Employment

About 53,000 persons were employed as dental laboratory technicians in 1980. Most worked in commercial dental laboratories, which usually are small, privately owned businesses with fewer than 10 employees. However, a few laboratories are much larger, and employ over 200 technicians. Dental laboratories are located mainly in large cities and populous States. Many laboratories receive work through the mail from dentists who work a considerable distance away.

About 9,000 dental laboratory technicians worked in dentists' offices. Others worked for hospitals that provide dental services and for the Federal Government, chiefly in Veterans Administration hospitals and clinics and in the Armed Forces.

## Training, Other Qualifications, and Advancement

No minimum formal education is needed to enter this occupation, but a high school diploma or its equivalent is an asset. Many dental laboratory technicians learn their craft on the job or through a registered apprenticeship program, although an increasing number complete institutional training programs before starting work. Apprenticeship or on-the-job training usually lasts 3 or 4 years, depending on the trainee's previous experience, ability to master the techniques, and the number of specialized areas to be learned. Classroom instruction for apprentices is provided in a few public vocational schools that offer courses in dental laboratory work.

Formal training for this occupation is available in dental laboratory technology pro-

Dental laboratory technicians generally need 4 to 5 years of training.

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grams, lasting up to 2 years, that are offered by community colleges, vocational-technical institutes, and trade schools. In 1980, programs accredited by the Commission on Dental Accreditation in conjuction with the American Dental Association (ADA) were offered in 57 schools. Most of the accredited programs lead to an associate degree; some to a certificate or diploma.

High school graduation or equivalent education is required to enter these programs. The training includes formal classroom instruction in dental law and ethics, chemistry, ceramics, metallurgy, and other related subjects. In addition, the student is given supervised practical experience in the school or dental laboratory. After completion of the 2-year training program, the trainee needs about 3 more years of practical experience to develop the skills needed to be recognized as a well-qualified dental laboratory technician. Those receiving dental laboratory training in the Armed Forces usually qualify for civilian jobs as dental laboratory technicians.

Dental laboratory technicians may become Certified Dental Technicians by passing written and practical examinations given by the National Board for Certification, a trust established by the National Association of Dental Laboratories. Certification is becoming increasingly important as evidence of a technician's competence.

Dental technicians, depending upon their skill, experience, and education, may advance to supervisory or managerial positions. Most of today's commercial laboratory owners came up "from the bench" to own their own business. For some technicians, career advancement means moving into a related job within the dental field; well-qualified technicians may become teachers in dental lab training programs, or sales representatives for dental products companies.

Among the personal traits important in this occupation are a high degree of finger and manual dexterity, good vision, and the ability to recognize very fine color shadings. These attributes must be combined with the ability to follow instructions and an inclination for detailed and absolutely accurate work. High school students interested in careers in this occupation are advised to take courses in art, crafts, metal shop, metallurgy, and sciences.

## Job Outlook

Job opportunities for well-qualified dental laboratory technicians are expected to be excellent through the 1980's. Experienced technicians should be able to establish laboratories of their own. A technician whose work has become known to several dentists in a community will have the best prospects of building a successful business.

Employment of dental laboratory technicians is expected to grow faster than the average for all occupations due to expansion of dental prepayment plans and the increasing number of older people who require dentures. Furthermore, dentists are expected to do less themselves and, instead, hire technicians for their dental practices or send their laboratory work to commercial firms.

In addition to job openings created by heightened demand for dental laboratory technicians, many openings will occur each year because of the need to replace technicians who transfer to other occupations, retire, or die.

## Earnings

Dental laboratory technicians who worked full time in commercial laboratories received average salaries of about $17,000 in 1980, according to the limited data available. Generally, education and experience, along with a specialized skill, bring higher earnings. For example, technicians who specialize in ceramics receive the highest salaries (up to $30,000). Large dental laboratories employ supervisors or managers who usually earn more than technicians. In general, earnings of self-employed technicians exceed those of salaried workers.

In the Federal Government, graduates of ADA-approved programs with no experience were paid starting salaries of about $11,000 a year in 1980. Experienced dental laboratory technicians employed in the Federal Government generally earned between $15,000 and $20,000 annually, with the average earning about $17,700 per year.

Many technicians in commercial laboratories receive paid holidays and vacations and some also receive paid sick leave, bonuses, and other fringe benefits. Technicians employed by the Federal Government have the same benefits as other Federal employees.

## Related Occupations

Dental laboratory technicians make artificial teeth, crowns and inlays, and orthodontic appliances following the specifications and instructions provided by the dentist. Other workers who provide services or make devices for physicians include arch-support technicians, orthotics technicians (braces/surgical supports), prosthetics technicians (artificial limbs/appliances), and opticians (optical mechanic).

## Sources of Additional Information

For information about training and a list of approved schools, contact:

American Dental Association, Council on Dental Education, 211 E. Chicago Ave., Chicago, Ill. 60611.

Information on scholarships is available from dental technology schools or from:

American Fund for Dental Health, 211 E. Chicago Ave., Chicago, Ill. 606ll.

For information on career opportunities in commercial laboratories and requirements for certification, contact:

National Association of Dental Laboratories, 3801 Mt. Vernon Ave., Alexandria, Va. 22305.

# Dispensing Opticians

(D.O.T. 299.474-010 and 713.361-010 and -014)

## Nature of the Work

Half the people in the United States use glasses or contact lenses to improve their vision. After a checkup by an eye doctor (ophthalmologist) or optometrist, who writes the prescription for corrective lenses, these people visit a dispensing optician (also called an *ophthalmic dispenser*). Dispensing opticians accept the prescription, help the customer select appropriate frames, write orders for ophthalmic laboratory work, and adjust the finished eyeglasses. In many States they also fit contact lenses.

Dispensing opticians measure the distance between the centers of the pupils of the eyes to determine where lenses should be placed in relation to them. In helping customers select from the various styles and colors of eyeglass frames, they consider the customer's hairstyle and facial features and also the weight and thickness of the corrective lenses.

Dispensing opticians also prepare work orders that give ophthalmic laboratory technicians the information they need to grind the lenses and insert them in a frame. The work orders include lens prescriptions and information on lens size, color, and style. After glasses are made, dispensing opticians use special instruments to check the power and surface quality of the lenses. Opticians then adjust the frame to the contours of the customer's face and head so that it fits properly and comfortably. Adjustments are made with handtools, such as optical pliers, files, and screwdrivers. Special instruments are used to check the power and surface quality of the lenses.

In fitting contact lenses, dispensing opticians follow ophthalmologists' or optometrists' prescriptions, measure the corneas of customers' eyes and then prepare specifications to be followed by the contact lens manufacturer. Contact lens fitting requires considerably more skill, care, and patience than conventional eyeglass fitting. Dispensing opticians tell customers how to insert, remove, and care for contact lenses during the initial adjustment period, which may last several weeks. The dispensing optician examines the patient's eyes, corneas, lids, and contact lenses with special instruments and microscopes at each visit. Ophthalmologists or optometrists recheck the fit, as needed. Opticians may make minor adjustments; lenses are returned to the manufacturer for major changes.

The majority of dispensing opticians are in the general practice of designing and fitting eyeglasses and contact lenses. But some specialize in the fitting of cosmetic shells to cover blemished eyes. Still others specialize in the fitting of prostheses (artificial eyes). In some shops, they may do lens grinding and finishing and sell other optical goods such as binoculars, magnify-

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ing glasses, and nonprescription eyeglasses (sunglasses, for instance).

## Working Conditions

Dispensing opticians work indoors in pleasant, quiet surroundings that are well lighted and well ventilated. Because they sell and service eye lenses, they deal with customers most of the time. They spend part of their time on their feet.

Dispensing opticians generally work a 40-hour week, although a 45- or 50-hour week is not uncommon. Some, especially those employed in retail shops in large shopping centers, work in the evenings and on Saturdays.

## Employment

About 18,000 persons worked as dispensing opticians in 1980. A large majority of them worked full time. Most dispensing opticians work for optical shops or for department stores, drug stores, and other retail outlets that sell prescription lenses. Some work for ophthalmologists or optometrists who sell glasses directly to patients. A few work in hospitals and eye clinics or teach in schools of ophthalmic dispensing. Some dispensing opticians own retail optical shops.

## Training, Other Qualifications, and Advancement

An increasing number of entrants to this occupation have some kind of formal training in optical dispensing and fabricating, and employers generally prefer to hire people who already are familiar with the trade. Nonetheless, the majority of dispensing opticians learn their skills on the job. On-the-job training in dispensing work may last several years and usually includes instruction in optical mathematics, optical physics, and the use of precision measuring instruments and other machinery and tools. Training programs vary from employer to employer. In large companies, on-the-job training is structured much like an apprenticeship program, while training in small establishments is largely informal.

Employers considering applicants for entry level jobs in optical dispensing look for high school graduates who have had courses in science and mathematics. Knowledge of physics, algebra, geometry, and mechanical drawing is particularly valuable. Previous work experience in a related job is an asset. Because dispensing opticians deal directly with the public, they should be tactful and have pleasant personalities. Good communications skills are highly valued.

Formal training in opticianry is offered by community colleges, vocational-technical institutes, trade schools, and manufacturers in programs that last from a few weeks to several years. In 1980, 18 schools offered 2-year programs in optical fabricating and dispensing leading to an associate degree. The Commission on Opticianry Accreditation—an organization created by the American Board of Opticianry, the National Academy of Opticianry, and the Opticians Association of America—accredits 11 of these programs. A number of schools offer shorter programs, usually 6 months to 1 year in length, that lead to a certificate or diploma in opticianry. In addition, some medical schools, contact lens manufacturers, and professional societies offer short, nondegree courses in contact-lens fitting. A small number of opticians learn their trade in the Armed Forces.

Many dispensing opticians go into business by themselves.

Some opticians acquire their skills through 2- to 4-year apprenticeship programs offered by optical dispensing companies. Apprentices with exceptional ability may complete their training in a shorter period. Individual States set the entrance requirements for these programs, with high school graduation ordinarily required. Apprentices receive training in optical mathematics and optical physics and in the use of laboratory equipment. In addition to technical training, apprentices may work directly with patients in fitting eyeglasses and contact lenses. Trainees also are taught the basics of office management and sales.

In 1980, 20 States and Puerto Rico required dispensing opticians to be licensed to dispense eyeglasses: Arizona, Arkansas, California, Connecticut, Florida, Georgia, Hawaii, Kentucky, Massachusetts, Nevada, New Jersey, New York, North Carolina, Ohio, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, and Washington. To obtain a license, applicants must meet certain standards of education and training and pass either a written or practical examination, or both. In a growing number of States, opticians must take continuing education courses to maintain their licenses. For specific requirements, consult the licensing board of the State.

The American Board of Opticianry certifies the competence of dispensing opticians by means of written examinations. The National Opticianry Competency Examination of this organization leads to the Certified Optician Certificate, which attests to entry level competence in the field. Experienced opticians can take the Master in Ophthalmic Optics Examination, which leads to the Master in Ophthalmic Optics Certificate. Similarly, the National Committee of Contact Lens Examiners offers the Contact Lens Registry Examination. Dispensing opticians who pass this exam are formally recognized as professionally competent to dispense contact lenses. Continuing education normally is required to maintain these various types of certification.

Many dispensing opticians go into business for themselves. Others may progress in their careers by becoming managers of retail optical stores or sales representatives for wholesalers or manufacturers of eyeglasses or lenses.

## Job Outlook

Employment of dispensing opticians is expected to increase faster than the average for

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all occupations through the 1980's. In addition to job openings which result from growth in demand for opticians, some openings will arise from the need to replace experienced workers who transfer to other kinds of work, retire, or die.

Demand for corrective lenses is expected to rise as the population grows and as the elderly population in particular continues its substantial increase. Older persons require more vision care, on the whole, than others. Increasing public awareness of the importance of good eyesight (stimulated, for instance, by the vision screening programs in schools) is also likely to spur demand. Heightened concern for hazards in the workplace, and compliance with industrial safety precautions, may lead to increased purchases of safety goggles and glasses. Fashion, too, is likely to influence demand. The growing variety of frame styles and colors—as well as the increasing popularity of contact lenses—should encourage individuals to buy more than one pair of corrective lenses. Finally, demand for vision care—and for corrective lenses in particular—is associated with coverage for these services under public and private health insurance programs.

Employment opportunities should be excellent for dispensing opticians who have an associate degree in opticianry. Opportunities will be best in metropolitan areas because owners operate many of the retail shops in small communities and do not need dispensing opticians.

This occupation is affected by the ups and downs of the business cycle as it affects retail trade. During recessions, some dispensing opticians are laid off.

## Earnings

The starting hourly wage rate for dispensing opticians in one of the higher paying areas of the country was $8.75 in 1980, based on information from a small number of union contracts. Dispensing opticians who own and operate their own shops can expect to earn considerably more, generally from $20,000 to $30,000 a year.

Apprentices start at a wage of about 60 percent of the skilled worker's rate and receive periodic increases so that upon completion of the apprenticeship program, they are earning the beginning rate for experienced workers.

Some dispensing opticians are members of unions. The principal union in this field is the International Union of Electrical, Radio and Machine Workers (AFL-CIO).

## Related Occupations

Other occupations in which workers with technical knowledge use machines and tools to do precise, delicate work include biomedical equipment technician, calibrator, dental laboratory technician, glass blower, instrument repairer, locksmith, ophthalmic laboratory technician, orthodontic technician, prosthetics technician, and watch repairer.

## Sources of Additional Information

A list of schools is available from:

National Academy of Opticianry, P.O. Box 19391, Washington, D.C. 20036.

National Federation of Opticianry Schools, Ophthalmic Dispensing Program, J. Sargeant Reynolds Community College, P.O. Box 12084, Richmond, Va. 23241.

Information about apprenticeships in the 20 States that require a license is available from the State agency responsible for occupational licensing. In the other 30 States and the District of Columbia, information is available from the Division of Apprenticeship Training of the State Department of Labor.

For general information about the occupation, contact:

International Union of Electrical, Radio and Machine Workers, 1126 16th St. NW., Washington, D.C. 20036.

National Federation of Opticianry Schools, Ophthalmic Dispensing Program, J. Sargeant Reynolds Community College, P.O. Box 12084, Richmond, Va. 23241.

Opticians Association of America, 1250 Connecticut Ave. NW., Washington, D.C. 20036.

Chairperson of Optical Council, IUE-AFL-CIO-CLC, 200 Park Ave. South, New York, N.Y. 10003.

# Furniture Upholsterers

(D.O.T. 780.381-018, -022; .684-122)

## Nature of the Work

Whether restoring a treasured antique or simply giving an ordinary living room couch a facelift, upholsterers combine artistic flair and manual skill to recondition sofas, chairs, and other upholstered furniture. These craft workers replace worn and damaged fabrics, springs, and padding. (Workers employed in the manufacture of upholstered furniture are not included in this statement.)

All custom upholstery involves two steps: Removing the old cover, padding, and springs; and rebuilding the piece. However, because of differences in the way furniture is constructed, each job is unique. The following is an explanation of some of the typical tasks involved in upholstering a piece of furniture.

Upholsterers usually place the furniture on padded wooden benches or some other type of support so that they may work at a convenient level. Using hammers and tack pullers, they remove tacks or staples that hold the old fabric to the wooden frame. After stripping the old fabric, they remove the burlap and padding that cover the arms, back, sides, and seat of the piece. Upholsterers examine the springs and remove broken or bent ones. The springs sit on a mat woven from strips of nylon, jute, or cotton cloth called webbing that is attached to the frame. If webbing is worn, upholsterers remove all the springs and all the webbing. At times, the springs are a prefabricated unit and must be completely replaced.

When rebuilding the furniture, upholsterers may reglue loose sections of the frame and refinish exposed wooden parts. If the mat that holds the springs was removed, they replace it. They tack webbing to one side of the frame, stretch it tight, and tack it to the opposite side. Other webbing is woven across the first and attached to the frame to form a new mat. After putting springs on the mat so they compress evenly, upholsterers sew or staple each spring to the webbing or frame and tie each spring to the ones next to it. Burlap then is stretched over the springs, cut and smoothed, and tacked to the frame. To form a smooth rounded surface over the springs and other parts of the frame, upholsterers cover each section of the furniture—seat, back, arms—with filling material. After sewing the filling to the burlap, they cover it with a layer of felt and heavy cloth and tack the cloth to the frame. Finally, upholsterers put on the new fabric cover, which has been cut to size for a section, such as an arm or the back, and temporarily stitched together for fitting. After checking that the cover fits tightly and smoothly—or noting where adjustments are necessary—they remove the cover and sew it together and tack, staple, or glue it to the frame. To complete the job, upholsterers sew, tack, or glue on fringe, buttons, or other ornaments.

Upholsterers use a variety of common handtools, including hammers, staple guns, tack and staple removers, pliers, and shears, and special tools such as webbing stretchers and upholstery needles. They also use sewing machines.

Sometimes upholsterers pick up and deliver furniture. Shop owners and managers order supplies and equipment and keep business records. Upholsterers often work with interior designers. They upholster furniture with fabrics selected by the designer. Some upholsterers help customers select new furniture covers.

## Working Conditions

Working conditions in upholstery shops vary—many shops are spacious, adequately lighted, well ventilated, and well heated; others are small and dusty. Upholsterers stand while they work and do a considerable amount of stooping and bending and some heavy lifting.

## Employment

About 35,000 people worked as furniture upholsterers in 1980. Most furniture upholsterers own and operate, or work in upholstery shops. These shops generally have fewer than three workers. Some upholsterers are employed by furniture stores. A few work for businesses, such as hotels, that maintain their own furniture.

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Sewing is one of the skills furniture upholsterers need.

Employment of upholsterers is concentrated in metropolitan areas, where the large population provides the greatest demand for upholsterers' services.

## Training, Other Qualifications, and Advancement

The best way to enter this trade is to start as a helper in an upholstery shop and learn on the job. Helpers learn by upholstering furniture under the direction of experienced workers. Much time and practice are needed to learn complex tasks such as measuring and cutting the new fabric and sewing and attaching it to the frame with a minimum of waste. Usually about 3 years of on-the-job training are required to become a fully skilled upholsterer.

Inexperienced persons may get basic training in upholstery from vocational or high school courses. However, additional training and experience in a shop usually are required before these workers can work as quickly and efficiently as experienced upholsterers. Although completion of an upholstery course does not assure a job, employers generally prefer to hire people with some knowledge of the trade.

Persons interested in becoming upholsterers should have manual dexterity, good coordination, and be able to do occasional heavy lifting. An eye for detail and flair for creative use of fabrics are helpful in making upholstered furniture as attractive as possible.

The major form of advancement for upholsterers is opening their own shop. It is easy to open a shop because only a small investment in handtools and a sewing machine is needed. However, the upholstery business is extremely competitive, so operating a shop successfully is difficult.

## Job Outlook

Employment of upholsterers is expected to grow more slowly than the average for all occupations through the 1980's. Most job openings will arise because of the need to replace experienced workers who transfer to other occupations, retire, or die.

Although more upholstered furniture will be used as population, personal income, and business expenditures grow, the demand for upholsterers will not keep pace with the growth in the amount of upholstered furniture in use because most consumers replace worn furniture rather than reupholster it. The desire of some consumers to keep high quality and antique furniture or to save money by reupholstering less expensive furniture will account for most of the limited employment growth that is expected in this field.

Inexperienced workers probably will have difficulty getting a job in upholstery shops because many shop owners will not take time from their work to supervise trainees.

## Earnings

Hourly wages for experienced furniture upholsterers ranged from $6.75 to $10 in 1980. Some highly skilled upholsterers earned over $10 an hour. Employers generally pay inexperienced trainees the minimum wage. Upholsterers usually buy their own handtools. Upholsterers generally work 40 hours a week. Business in upholstery shops usually increases during the last 4 months of the year. However, upholsterers usually do not work overtime and they rarely are laid off during the slack season.

Some upholsterers are members of the Upholsterers' International Union of North America.

## Related Occupations

Other workers who combine manual skills and a knowledge of materials such as fabrics and wood to repair things are automobile upholsterers, fur cutters, furniture finishers, rug repairers, and shoe repairers.

## Sources of Additional Information

For details about work opportunities for upholsterers in your area, contact local upholstery shops, the local office of the State employment service, or a local of the Upholsterers' International Union.

# Instrument Makers (Mechanical)

(D.O.T. 600.280-010)

## Nature of the Work

Instrument makers (also called experimental machinists and modelmakers) are among the most skilled of all machining workers. They work closely with engineers and scientists to translate designs and ideas into experimental models, special laboratory equipment, and custom instruments. Experimental devices constructed by these craft workers are used, for example, to regulate heat, measure distance, record earthquakes, and control industrial processes. The parts and models may range from simple gears to intricate parts of navigation systems for guided missiles. Instrument makers also modify existing instruments for special purposes.

Instrument makers perform many tasks similar to those done by all-round machinists, tool-and-die makers, and setup workers. For example, they may set up and use machine tools such as lathes and milling machines to cut and form metal parts for instruments. In addition, they use handtools such as files and chisels to smooth rough metal parts. As in other types of machining work, accuracy is important. Like most machining workers, instrument makers measure finished parts to make sure they meet specifications. They use a wide variety of precision measuring equipment, including micrometers, vernier calipers, and dial indicators.

Unlike other skilled machining workers, instrument makers often are not given detailed instructions, such as blueprints, for their work. Instead, they may work from rough sketches or verbal instructions, or they may simply be given a concept to work with. As a result, their work often requires considerable imagination and ingenuity. In addition, they must often work to much closer tolerances than other machining workers. Sometimes specifications must not vary more than one ten-thousandth of an inch. To meet these standards, they use special equipment or precision devices, such as the electronic height gauge, which other machining workers seldom use. They also work with a wider variety of materials than other machining workers. These materials include plastics and rare metals such as titanium and rhodium.

In some instances, instrument makers work on instruments from start to finish. That is, they make and assemble all the parts, and

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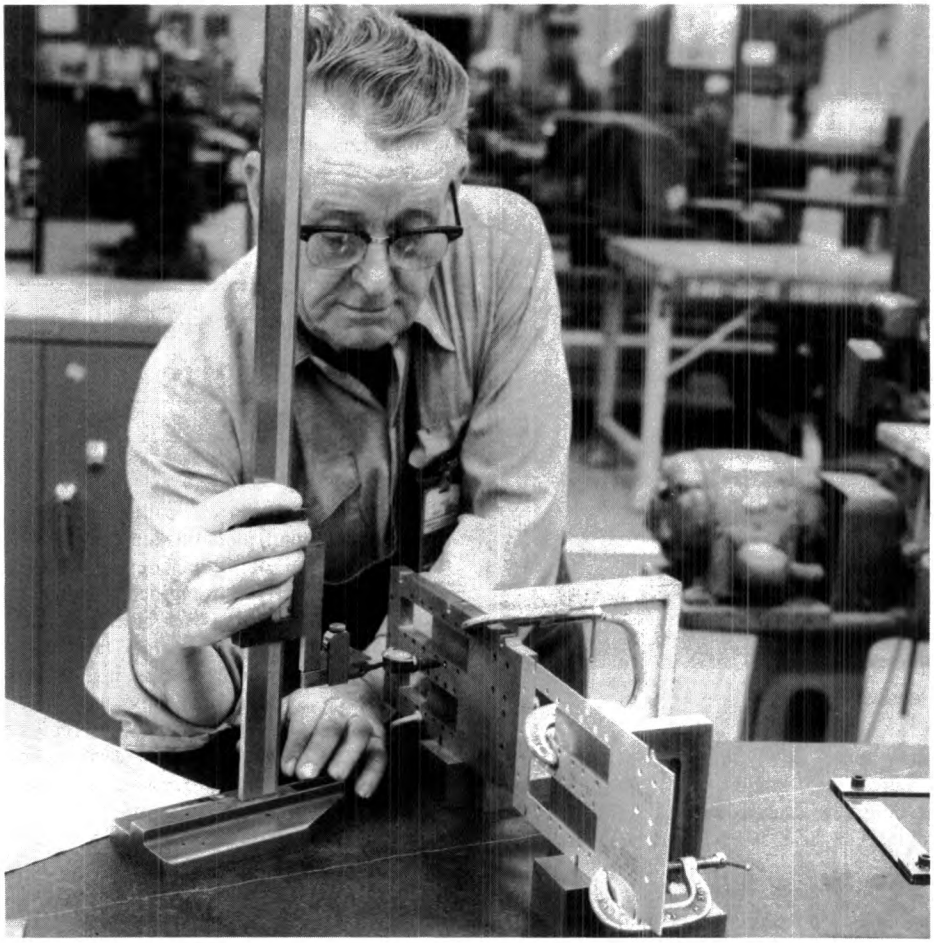

Some instrument makers produce prototypes of new products.

then test the finished product. However, in large shops, or where time is important, the work may be divided among a number of workers. Similarly, if an instrument has electrical or electronic components, electronic specialists may be consulted.

## Working Conditions

Instrument makers often work under nearly ideal conditions. Because of the delicate nature of the mechanisms they work on, instrument makers may work in the controlled environment of "white rooms." These rooms are well lighted, slightly pressurized, temperature controlled, and dust free.

Serious work accidents are not common, but machine tools and flying bits of metal may cause finger, hand, and eye injuries. To prevent such accidents, instrument makers must follow certain safety rules for machine tools. These rules require special glasses, aprons, and tightly fitted clothing.

## Employment

Many of the approximately 4,300 instrument makers employed in 1980 worked for firms that manufactured instruments. Others worked in research and development laboratories that make special devices for scientific research. The Federal Government employs many instrument makers.

The main centers of instrument making are located in and around a few large cities, particularly New York, Chicago, Los Angeles, Boston, Philadelphia, Washington, Detroit, Buffalo, and Cleveland.

## Training, Other Qualifications, and Advancement

Some instrument makers advance from the ranks of machinists or skilled machine tool operators. These already skilled craft workers begin by doing simple instrument-making tasks under close supervision. Usually 1 to 2 years or more of instrument shop experience are needed to qualify as instrument makers.

Other instrument makers learn their trade through apprenticeships that generally last 4 years. A typical 4-year program includes 8,000 hours of shop training and 576 hours of related classroom instruction. Shop training emphasizes the use of machine tools, handtools, and measuring instruments, and the working properties of various materials. Classroom instruction covers related technical subjects such as mathematics, physics, blueprint reading, chemistry, metallurgy, electronics, and fundamental instrument design. Apprentices must learn enough shop mathematics to plan their work and to use formulas to solve problems in machining and assembly. Mechanical aptitude and manual dexterity are essential.

For apprenticeship programs, employers generally prefer high school graduates who have taken algebra, geometry, trigonometry, science, and machine shopwork. Further technical schooling in electricity, physics, machine design, and electronics often is desirable, and may make possible future promotions to technician jobs.

Persons interested in becoming instrument makers should have a strong interest in mechanical subjects and better than average ability to work with their hands. They must have initiative and resourcefulness because instrument makers often work with little or no supervision. Since instrument makers often face new problems, they must be able to develop original solutions. Frequently, they must visualize the relationship between individual parts and the complete instrument and must understand the principles of the instrument's operation. Because of the nature of their jobs, instrument makers have to be very conscientious and take considerable pride in creative work.

As instrument makers' skills and knowledge improve, they may advance to more responsible positions. For example, they may plan and estimate time and material requirements for the manufacture of the instruments or provide specialized support to professional personnel. Others may become supervisors and train less skilled instrument makers.

## Job Outlook

Employment in this very small occupation is expected to increase at about the same rate as the average for all occupations through the 1980's. Some workers will be needed to make prototypes of new instruments for mass production and also to make custom or special instruments, particularly in the expanding field of industrial automation. Also, more versatile and sensitive precision instruments can be expected to emerge from current research and development programs. Most openings, however, will occur as workers transfer to other occupations, retire, or die. Overall, replacement needs will be small because there are so few workers in this field.

Inasmuch as instrument makers develop products for future industrial use more than for current consumption, fluctuations in the business cycle seldom affect employment. Because of the time required to develop sophisticated instruments that will improve industrial production, these workers tend to be insulated from possible layoff. Also, employers fear they may be unable to re-hire highly skilled workers when economic conditions improve.

## Earnings

Earnings of instrument makers compare favorably with those of other highly skilled metalworkers. In 1980, instrument makers had average earnings of $9.78 an hour. In comparison, all production workers in manufacturing industries averaged $7.27 an hour.

Many instrument makers are union members. Among the unions representing them

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are the International Association of Machinists and Aerospace Workers; the International Brotherhood of Electrical Workers; and the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America.

### Related Occupations

Occupations most closely related to instrument maker are, of course, other machining occupations. These include all-round machinists, tool-and-die makers, machine tool setup workers, and machine tool operators.

Other occupations that require precision and skill in working with metal include arc cutters, blacksmiths, locksmiths, patternmakers (metal), and welders.

### Sources of Additional Information

See the list under this same heading in the statement on all-round machinists elsewhere in this section.

## Jewelers

(D.O.T. 700.281-010, -014, -022, and .381-030, -042, and -046)

### Nature of the Work

For thousands of years people have worn and admired jewelry made from precious metals and stones, such as gold and diamonds. Jewelers use such materials to make and repair rings, necklaces, earrings, and other jewelry.

Jewelers work in stores, factories, and repair shops. Jewelers who work in stores and repair shops have a wide variety of duties; those who work in factories have more specialized duties.

In jewelry stores and repair shops, jewelers generally offer many services to their customers. Much of their time is spent repairing jewelry. Typical repair jobs are enlarging or reducing rings, resetting stones, and replacing broken clasps and mountings. Some jewelers also may make jewelry by hand, repair watches, and do hand engraving. A small number are qualified gemologists and appraise the quality and value of diamonds and other gemstones.

Jewelers who own stores or shops have additional responsibilities. Besides working on jewelry, these small business people hire employees, order and sell merchandise, and handle other managerial duties.

In jewelry factories, workers generally have one job in the manufacturing process. For example, some make molds to cast jewelry or dies to stamp it. Others do finishing work, such as setting stones and engraving. However, a small number of the most highly skilled jewelers make entire jewelry pieces. Following their own designs or those created by designers, they shape the metal with pliers or other handtools or cast it in molds. Individual parts are soldered to form the finished piece. Designs may be carved in metal, and diamonds or other stones mounted.

Jewelers use pliers, files, saws, hammers, torches, soldering irons, and a variety of other small handtools. They use chemicals and polishing compounds, such as jeweler's rouge, for soldering and finishing. Because the work is very detailed, jewelers often wear magnifying glasses.

### Working Conditions

Jewelers usually work in comfortable surroundings and the trade involves few physical hazards. However, doing delicate work while trying to satisfy demands for speed and quality from customers and employers can cause some stress.

In stores and repair shops, jewelers generally work alone with little supervision. However, in retail stores they may talk with customers about repairs and even do some sales work.

### Employment

About 28,000 people had jobs as jewelers in 1980. About two-fifths of all jewelers are self-employed, operating jewelry stores or repair shops.

Most jewelers employed in precious jewelry manufacturing work in or near New York City. Although jewelry stores and repair shops are located throughout the country, most jobs in these establishments are in metropolitan areas.

### Training, Other Qualifications, and Advancement

Jewelers' skills usually are learned through training on the job or in technical schools.

Technical schools programs are the major source of training for people who want jobs in jewelry stores or repair shops. In these programs, which last from 6 months to 3 years students learn the use and care of jewelers' tools and machines and basic jewelers' skills, such as casting, stone setting, polishing, and design. Store and shop owners prefer graduates of these programs over people with no experience in the trade. However, most employers feel that graduates need an additional 3 years or more of supervised on-the-job training to refine their repair skills and to learn more about the operation of the store or shop.

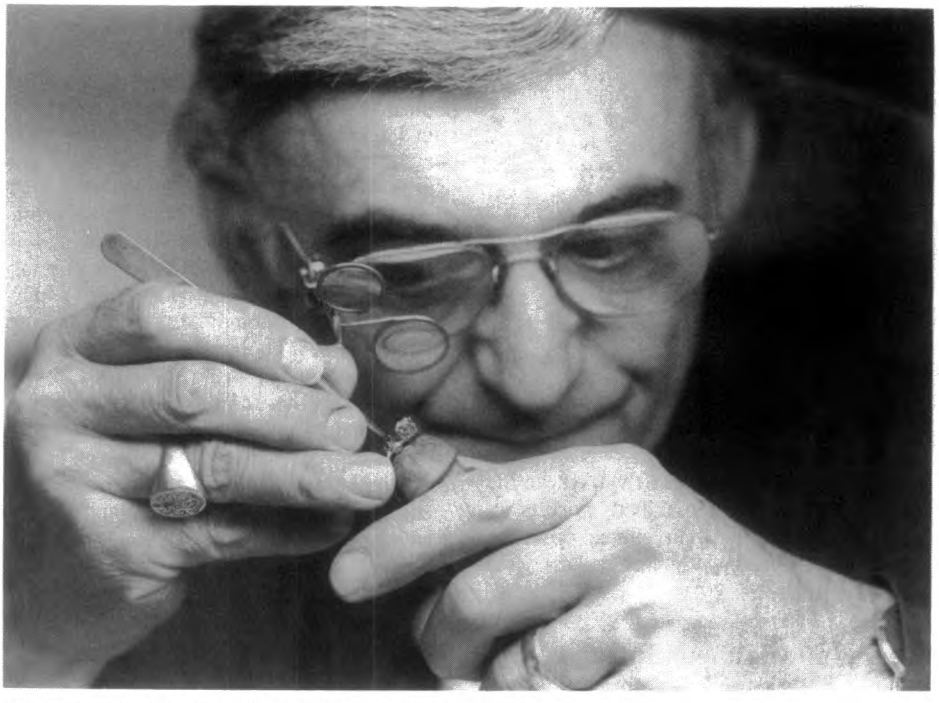
In jewelry factories, manufacturers provide on-the-job training in jewelry making skills for their production workers. Training can last for 3 to 4 years, depending on the difficulty of the skill. Training focuses on a particular specialty—casting, stone setting, engraving.

A high school educaton is desirable for young people entering the trade. Courses in art, mechanical drawing, and chemistry are useful, depending on which aspect of the trade one chooses to follow.

The precise and delicate nature of jewelry work requires finger and hand dexterity, good eye-hand coordination, patience, and concentration. Artistic ability is a major asset, because jewelry must be stylish and attractive.

In manufacturing, jewelers sometimes advance to supervisory jobs; however, advancement opportunities generally are limited. Jewelers who work in jewelry stores or repair shops may become salaried managers of jewelry stores; some open their own businesses.

A substantial financial investment is required to operate a jewelry store, because an inventory of expensive merchandise must be obtained. The jewelry business also is highly



Working with precious metals often requires a delicate touch.

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competitive. Jewelers who plan to open their own stores should have experience in selling.

## Job Outlook

Employment of jewelers is expected to increase as fast as the average for all occupations through the 1980's. Besides new jobs arising from growth on demand for jewelers, job openings will result from the need to replace experienced jewelers who retire, die, or transfer to other occupations. Overall, the job outlook will be better in jewelry stores and repair shops than in jewelry factories.

Demand for jewelry repair will increase as rising prices of gold and gems make old jewelry more valuable. When more store owners offer jewelry repair service to meet this increased demand, job opportunities for jewelry repairers in stores and repair shops will increase. Jewelers should enjoy steady work even during economic downturns because the demand for jewelry repair is less sensitive to economic conditions than demand for new jewelry.

Busy store and shop owners often are reluctant to hire untrained and inexperienced workers. People entering the trade may have trouble finding a job unless they can demonstrate their ability. Such persons can improve their chances for employment by attending a technical school with a good reputation among local store or shop owners.

Job opportunities for jewelers in factories will decline through the 1980's because of the increased use of mass production. In addition, the job outlook for jewelers in factories depends on the sales of jewelry. When inflation and recession force people to spend less on luxuries, such as jewelry, job opportunities in jewelry factories decline.

## Earnings

In 1980, jewelers typically earned about $250 a week, according to the limited information available. Earnings of experienced, unionized jewelry workers in manufacturing ranged from about $5.50 to $8 an hour. New workers in jewelry factories received $3.65 an hour to start. New workers receive periodic raises up to the minimum union wage for their job.

In some precious jewelry factories the workweek is 35 hours. Most jewelers in stores and repair shops work 40 to 48 hours a week. During peak sales seasons, such as Christmas, they often work over 50 hours a week.

## Related Occupations

Jewelers are important craft workers in the jewelry industry. Other skilled workers in this industry include gem cutters, gemologists, hand engravers, model makers, and watch repairers.

## Sources of Additional Information

For information on job opportunities in jewelry stores, contact:

Jewelers of America, Time-Life Building, Suite 650, 1271 Avenue of the Americas, New York, N.Y. 10020.

# Lithographers

(D.O.T. 971.381-050; 972.281-010, .282-010, .381-014 and -022)

## Nature of the Work

Lithography, also called offset printing, is the most efficient and fastest growing method of printing. It is a process of photographing the material to be printed, making a printing plate from the film, and pressing the inked plate against a rubber covered roller which in turn presses the ink onto the paper.

Lithographers are responsible for a variety of printing activities ranging from photographing copy and pictures to making the final printing plates. Most lithographers specialize in one occupation, such as camera operator, artist, stripper, or platemaker.

*Camera operators* start the process of making a lithographic plate by photographing and developing negatives of the material. They generally are further classified as line camera operators, halftone operators, or color separation photographers. Negatives may need retouching to lighten or darken certain parts. *Lithographic artists* make these corrections by sharpening or reshaping images on the negatives. They do the work by hand, using chemicals, dyes, and special tools. Lithographic artists must know the characteristics of all types of paper and must produce fine shades of color. Like camera operators, they are assigned to only one phase of the work, and may have job titles such as dot etchers, retouchers, or letterers.

*Assemblers* cut the film to required size and arrange and paste the negatives onto layout sheets, which are used by platemakers to make press plates. *Platemakers* cover the surface of flat pieces of metal with a coating of photosensitive chemicals, or may use plates with the coating already applied. They then put the layout sheet on top of the plate and expose both to bright lights. As the final step, platemakers treat the plate with chemicals to bring out the images of the material to be printed. In a growing number of printing plants, lithographic platemakers use machines which automatically process the plates. This new equipment places more emphasis on technical skills than craft skills. The platemaker is responsible for operating and maintaining the machine and insuring that plates meet quality standards. When a large number of plates or multiple images are needed, operators use a step and repeat machine.

## Working Conditions

Although lithographers stand most of the time, the work is not physically demanding. Lithographic artists and assemblers may find working with fine detail tiring and fatiguing to eyes. Platemakers working with toxic chemicals may be exposed to skin irritations. Work areas usually are well lighted and air-conditioned.

Lithographers generally work a regular 8-hour day but they sometimes have to work overtime to meet publication deadlines. Some lithographers work night shifts.

## Employment

About 45,000 skilled lithographers were employed in 1980. Many worked for commercial printing plants, newspapers, and book and magazine printers. Some worked in U.S. Government printing plants.

Although lithographic workers are located in all parts of the country, most are employed in large printing centers such as New York, Chicago, Los Angeles, Philadelphia, and Washington, D.C.

## Training and Other Qualifications

Many lithographers, particularly in small companies, learn the trade through on-the-job training—working as helpers and observing and being taught by experienced lithographers. However, a 4-year apprenticeship program usually is required in order to become a skilled lithographic craft worker. These programs may emphasize a specific craft, such as camera operator or lithographic artist, although an attempt is made to make the apprentice familiar with all lithographic operations.

Usually, apprenticeship applicants must be in good physical condition, high school graduates, and at least 18 years of age. Aptitude tests usually are given to prospective apprentices to determine if they are suited for the work.

Many technical institutes, junior colleges, and colleges offer 2-year programs in printing technology which provide a valuable background for persons interested in learning lithographic crafts. High school and vocational school training in printing, photography, mathematics, chemistry, physics, mechanical drawing, and art also is helpful.

Camera operators should have an understanding of chemistry, optics, and the entire offset and photographic process. Precision, patience, good eyesight, and artistic skills are important qualifications for lithographic artists and assemblers. A knowledge of electronics is becoming increasingly important because electronic equipment is coming into greater use for multicolor printing.

## Job Outlook

Employment of lithographers is expected to increase faster than the average for all occupations through the 1980's. Besides employment arising from the increase in demand for lithographers, job openings will result from the need to replace workers who retire, die, or change occupations.

Employment of lithographic workers is expected to increase in response to the continued growth of offset printing. Commercial printing firms and newspaper publishers in-

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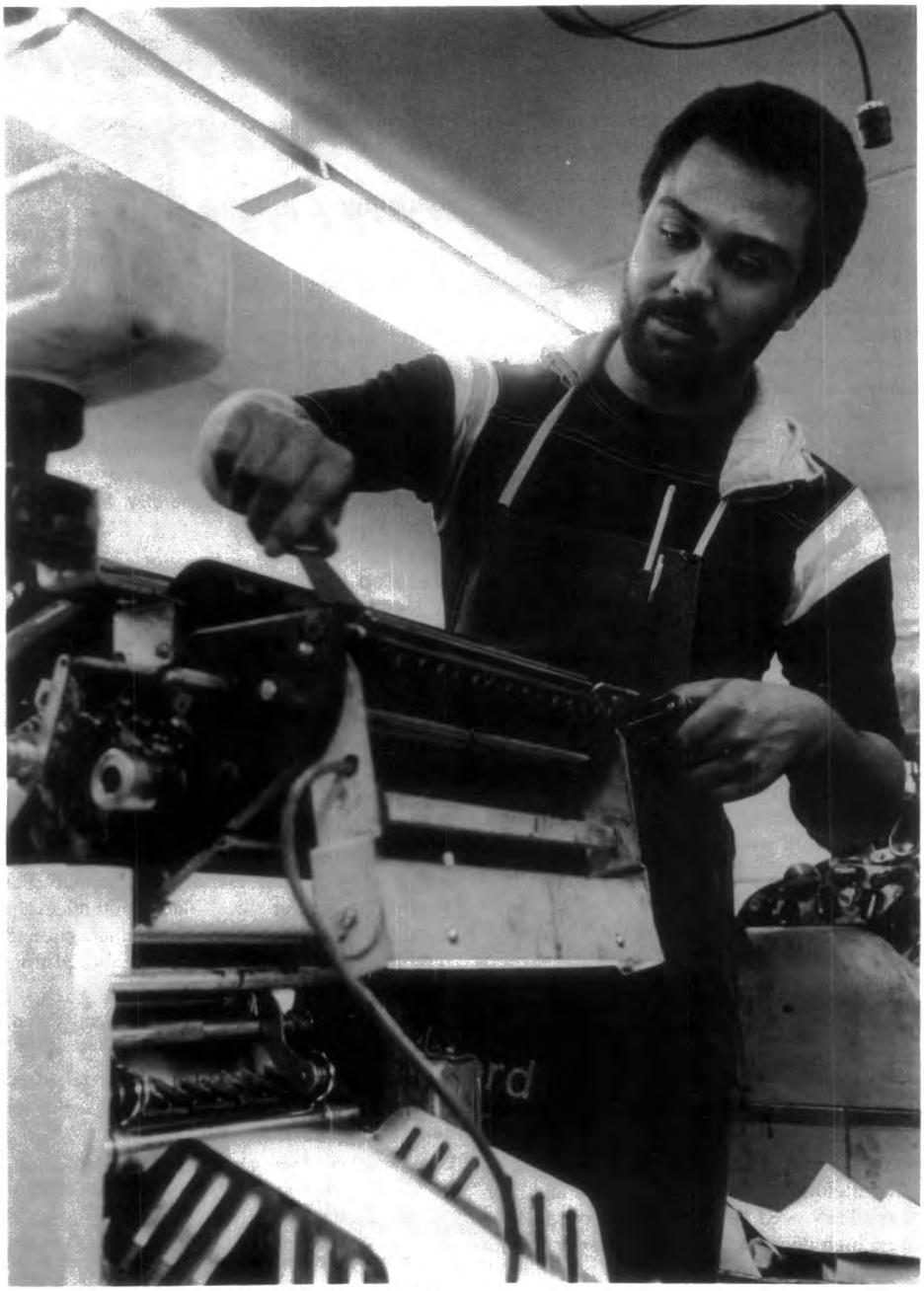

Lithographer operating a small offset press.

creasingly are using offset printing methods instead of letterpress. Demand for workers also will result from the greater use of photographs and drawings in printed matter, and by the more widespread use of color in many printed products. In addition, lithographic work is less suited to mechanization than other printing processes.

Employment opportunities should be best for people who have completed post-high school programs in printing technology, such as those offered by technical institutes and junior colleges. Many employers prefer to hire applicants who have completed these programs because the comprehensive training they receive helps them learn lithography and adapt more rapidly to new processes and techniques.

## Earnings

According to a 1980 survey of union wages, the estimated average minimum hourly rate for lithographic artists was $12.81; for assemblers, $12.54; for camera operators, $12.65; and for platemakers, $12.53. In 1980, the average hourly rate for all nonsupervisory and production workers in private industry, except farming, was $6.66.

## Related Occupations

Lithographers are required to use artistic skills in their work. Artistic skills are also essential for occupations such as sign painters, jewelers, decorators, engravers, and photoengravers.

## Sources of Additional Information

Details on apprenticeship and other training opportunities in lithographic occupations are available from local employers such as newspapers and printing shops, local offices of the Graphic Arts International Union, or the local office of the State employment service. For information on schools that offer courses in printing technology, write to:

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

For general information on lithographic occupations, write to:

Graphic Arts International Union, 1900 L St. NW., Washington, D.C. 20036.

International Printing and Graphic Communications Union, 1730 Rhode Island Ave. NW., Washington, D.C. 20036.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22201.

# Molders (Foundry)

(D.O.T. 518.361-010 and .682-010)

## Nature of the Work

One of the oldest known methods of making metal products is casting—the process of pouring molten metal into a previously made mold. When the metal cools and hardens, it takes the shape of the mold. Metalcasting is one of the fastest, most economical, and versatile ways to produce metal products.

There are several different ways of making the molds that are used in casting, but green sand molding is the most common because it is so economical. In green sand molding, molders pack and ram a specially prepared mixture of sand, clay, and chemicals around a pattern of the object that is to be cast. The molding sand is contained in a box called a flask. The flask usually is made in two parts that can be separated to remove the pattern without damaging the mold cavity. When molten metal is poured into the cavity, it solidifies as it cools, and forms the casting.

Technologically advanced molding machines that pack and ram the sand mechanically are now used to make most molds. Thus, most of the workers in this occupation are machine molders. *Machine molders* (D.O.T. 518.682-010) operate machines that speed up and simplify the making of large quantities of identical sand molds. Their job includes setting up the machine, controlling the pressure applied to the sand by working the levers and pedals, and cutting pouring spouts in the mold. Machine molders also assemble the flask and pattern on the machine table and fill the flask with the prepared sand mixture.

In a few foundries, hand molders still construct the sand molds, using primarily manual methods. Power tools, such as pneumatic rammers and squeeze plates, and handtools, such as trowels and hand rammers, are used to compact the sand. Molds for small castings usually are made on the workbench by *bench molders* (D.O.T. 518.361-010); those for large and bulky castings are made on the foundry floor by *floor molders* (D.O.T.

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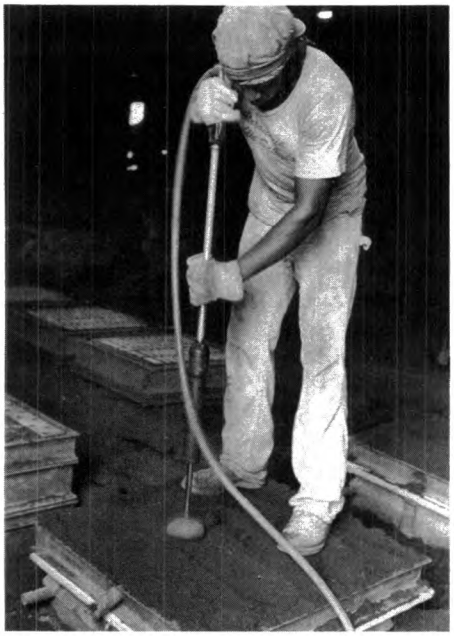

This molding job requires strength, coordination, and physical stamina.

518.361-010). An all-round hand molder can make many different types of molds. A less skilled molder may specialize in only a few simple types.

Other workers who have an important role in the foundry metalcasting process are coremakers and patternmakers. For a description of these jobs, see those statements elsewhere in this section.

## Working Conditions

Working in a foundry can be hazardous, and the injury rate is higher than the average for all manufacturing industries. Molders must be careful to avoid burns from hot metal and to avoid cuts and bruises when handling metal parts, molds, and power tools. Safety programs at many foundries and use of safety equipment, such as safety shoes, have helped reduce injuries.

Working conditions vary considerably from one foundry to another. In many plants, improved ventilation systems and air-conditioning have reduced greatly the heat, fumes, and dust associated with this work; however, in some older foundries, these hazards still exist.

## Employment

In 1980, about 24,000 persons worked as molders in plants that make and sell castings. Most of these foundries are small shops that employ fewer than 250 people. Although foundries are located throughout the country, the largest are concentrated in areas that are readily accessible to raw materials. The Great Lakes States, the west coast, and Alabama all have considerable metalcasting production.

## Training, Other Qualifications, and Advancement

Completion of a 2-to 4-year apprenticeship program, or a comparable amount of on-the-job experience, is needed to become a skilled hand molder. Workers with this training also are preferred for some kinds of machine molding, but in general, a shorter training period is required in order to become a qualified machine molder. An eighth grade education usually is the minimum requirement for all trainees. Many employers may prefer high school graduates, however.

Apprenticeship programs generally are sponsored jointly by the employer and the International Molders' and Allied Workers' Union. Under close supervision from skilled molders, apprentices begin with simple jobs, such as shoveling sand, and then gradually take on more difficult and responsible work, such as ramming molds, withdrawing patterns, and setting cores. They also learn to operate the various types of molding machines. As their training progresses, they learn to make complete molds. In addition, the apprentice may work in other foundry departments to develop all-round knowledge of foundry methods and practices. The apprentice usually receives at least 144 hours of classroom instruction each year in subjects such as shop mathematics, metallurgy, and shop drawing.

Hand molders who do highly repetitive work that requires less skill usually learn their jobs during a brief training period. Trainees work with an experienced molder to make a particular kind of mold. After 2 to 6 months, the trainee usually is capable of making a similar mold without any help. Most machine molders also learn the necessary skills in a few months of informal on-the-job training. The length of training varies by individual and foundry, but generally is less than the time required for hand molders.

Physical standards for molding jobs are fairly demanding. Molders stand while working, must move about a great deal to do accurate work, and must be competent in using molding tools such as shovels and rammers. They need good eye-hand coordination and a high degree of manual dexterity. Molders may advance to a specialized molding job or evenually to a supervisory position.

## Job Outlook

Employment of molders is expected to increase more slowly than the average for all occupations through the 1980's. Although demand for metal castings is expected to increase significantly, the trend toward more automatic machine molding and other labor-saving innovations will allow large increases in production with only moderate increases in employment.

Some job openings will arise because of the need to replace experienced molders who transfer to other occupations, retire, or die. The number of openings, however, may fluctuate greatly from year to year because the demand for a number of foundry products is sensitive to changes in the economy. Farm machinery and motor vehicles manufacturing are industries, for example, that use castings as components in their products. When demand for these products slackens, as often happens during recessions, demand for metal castings also declines. Therefore, foundry workers may experience layoffs or shortened workweeks when economic conditions are poor.

## Earnings

In January 1980, average straight-time hourly earnings of floor molders ranged from $6.50 in nonferrous foundries to $6.90 in iron and steel foundries, according to a wage survey made by the National Foundry Association. Bench molders averaged $5.70 in iron foundries and $6.10 in steel and nonferrous foundries. By comparison, production workers in all manufacturing industries averaged $7.27 an hour. Molders who were paid on an incentive basis generally had higher earnings.

## Related Occupations

Other workers who need a knowledge of metal characteristics, molding sand, and pouring procedures are molding machine setters, mold-maker helpers, mold closers, sand-slinger operators, pattern molders, and jewelry bench molders.

## Sources of Additional Information

For details about training opportunities for molders, contact local foundries, the local office of your State employment service, the nearest office of the State apprenticeship agency, or the Bureau of Apprenticeship and Training, U.S. Department of Labor. Information also is available from:

International Molders' and Allied Workers' Union, 1225 E. McMillan St., Cincinnati, Ohio 45206.

Additional career guidance material—free when requested on stationery with a school letterhead—is available from:

American Foundrymen's Society/Cast Metals Institute, Golf and Wolf Rds., Des Plaines, Ill. 60016.

# Ophthalmic Laboratory Technicians

(D.O.T. 713.681-010 and .684-026 and -038; 716.280-008, -010, and -014, .360-010, .382-010, -018, and -022, .462-010, .681-018, .682-010, -014, and -018, and .685-018 and -022)

## Nature of the Work

Ophthalmic laboratory technicians (also called *optical mechanics*) make prescription eyeglasses. Following the specifications provided by a dispensing optician, ophthalmologist (eye doctor), or optometrist, they cut, grind, and finish prescription lenses and assemble them with frames to produce finished glasses. Some ophthalmic laboratory technicians help make contact lenses.

There are two types of ophthalmic laboratory technicians: Surfacer (or lens grinder)

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and bench technician (or finisher). In small laboratories, one person may perform the tasks of both a surfacer and a finisher. Starting with standard size lens blanks, which large optical firms mass-produce, surfacers set up and operate machines to grind and polish eyeglass lenses according to prescription specifications. They use precision instruments, such as focimeters and objective lens analyzers, to measure the lenses and make sure that they fit the prescription. In large laboratories, work is divided into separate operations which are performed mainly by workers who operate power grinding and polishing machines.

Bench technicians mark and cut lenses and smooth their edges to fit frames. They then assemble the lenses and frame parts into finished glasses. Bench technicians use special tools, such as lens cutters and glass drills, as well as small files, pliers, and other handtools. They also use automatic edging machines to shape lens edges and precision instruments to detect imperfections. In large laboratories, the duties of bench technicians are divided into several operations which are performed mainly by skilled workers.

## Working Conditions

Ophthalmic laboratory technicians work with machines that make a constant humming, whining sound. Sometimes they need to wear goggles to protect their eyes. Because most of their time on the job is spent standing, these workers are subject to fatigue. Most ophthalmic laboratory technicians work a 5-day, 40-hour week.

Opthalmic laboratory technicians operate machines that grind and polish lenses.

## Employment

Almost 27,000 persons were employed as ophthalmic laboratory technicians in 1980. They worked in ophthalmic laboratories, for the most part. However, some worked for opticians, or for department stores, drugstores, and other retail firms that have optical departments. A few worked for ophthalmologists or optometrists who dispense glasses directly to patients. Some technicians work part time.

Ophthalmic laboratory technicians are found in every State. However, employment is concentrated in large cities and in populous States.

## Training, Other Qualifications, and Advancement

Ophthalmic laboratory technicians usually learn their skills on the job. Employers prefer applicants for entry level jobs to be high school graduates who have had courses in science and mathematics. A knowledge of physics, algebra, geometry, and mechanical drawing is particularly valuable. Interest in and ability to do precision work are essential.

At first, technician trainees perform simple tasks such as processing lenses through a grinding machine. As they gain experience, they progress to operations such as lens cutting and eyeglass assembly. When trainees have acquired experience in many types of work, which usually takes about 3 years, they are considered all-round optical mechanics. Some technicians specialize in one type of job, such as surfacing or bench work. The training time required to become a specialist is less than that needed to become an all-round technician.

Besides on-the-job training, there are other routes to enter this occupation. High school graduates can prepare to become technicians through 3- to 4-year formal apprenticeship programs operated by optical goods companies. Apprentices with exceptional ability may complete their training in a shorter period. Requirements for entry into these programs vary from State to State, but high school graduation usually is needed. Most training authorities agree that technicians who learn as apprentices have more job opportunities and more opportunities for advancement than those without such training. Persons interested in apprenticeships should check with the Division of Apprenticeship Training of their State's Department of Labor.

Apprentices are generally trained to be either ophthalmic surfacers or finishers. Ophthalmic surfacers receive training in lens grinding and ophthalmic finishers learn to assemble eyeglasses into frames and to do frame repair.

Some technicians learn their trade in the Armed Forces. Others complete programs in optical technology offered by community colleges, vocational-technical institutes, or trade schools. Graduates receive certificates, diplomas, or associate degrees for programs varying in length from 6 months to 2 years. Graduates generally need some additional on-the-job training.

The State of New Jersey requires ophthalmic laboratory technicians to be licensed. Applicants must meet certain standards of education and training and pass a written or practical examination. For specific requirements, consult the State licensing board.

Ophthalmic laboratory technicians can become supervisors and managers. Some technicians become dispensing opticians, although the trend is to train specifically for optician jobs. Some technicians, especially those receiving their training in both shop and dispensing work, may go into business for themselves.

## Job Outlook

Employment of ophthalmic laboratory technicians is expected to increase about as fast as the average for all occupations through the 1980's. Although some openings will result from growth in demand for technicians, most will arise from the need to replace experienced workers who transfer to other occupations, retire, or die. Persons who have completed a formal training program should have the best opportunities for these jobs.

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Conflicting trends will affect employment of ophthalmic laboratory technicians in the 1980's. On the one hand, more technicians will be needed because of the rising demand for corrective lenses. Demand is expected to increase in response to overall population growth and the substantial increase in the number of elderly persons in particular. Older people tend to require the most vision care. Also contributing to demand for corrective lenses is increasing public awareness of the importance of good eyesight, stimulated in part by vision screening programs in the schools. Fashion also spurs demand, as prescription eyeglasses are increasingly used as a fashion accessory—thus encouraging individuals to buy more than one pair. Further, health insurance coverage for vision care services—specifically including eyeglasses and contact lenses—plays a role. Any broadening or reduction in coverage under Medicare, Medicaid, or private health insurance would be likely to affect demand for corrective lenses.

However, technological innovations that reduce labor requirements are being introduced in optical laboratories, especially in the larger ones. The machines used to grind and polish lenses have become increasingly sophisticated, and computers are taking over some functions previously performed by ophthalmic laboratory technicians. The cumulative effect of these advances has been to increase technicians' productivity, enabling them to produce more per person than before.

The business cycle has an impact on employment in this occupation. During recessions some technicians are laid off, and, conversely, during periods of economic upswing, more technicians are hired.

## Earnings

The starting hourly wage rate for ophthalmic laboratory technicians in one of the higher paying areas of the country was $7.60 in 1980, based on information from a small number of union contracts.

Apprentices start at about 60 percent of the skilled worker's wage rate and receive periodic increases so that upon completion of the apprenticeship program, they are earning the beginning rate for experienced workers.

Some ophthalmic laboratory technicians are members of unions. The principal union in this field is the International Union of Electrical, Radio and Machine Workers (AFL-CIO).

## Related Occupations

Other occupations in which workers with technical knowledge use machines and tools to do precise, delicate work include biomedical equipment technicians, calibrators, dental laboratory technicians, dispensing opticians, glass blowers, instrument repairers, locksmiths, orthodontic technicians, prosthetics technicians, and watch repairers.

## Sources of Additional Information

A list of schools offering courses for people who wish to become ophthalmic laboratory technicians is available from:

National Academy of Opticianry, P.O. Box 19391, Washington, D.C. 20036.

National Federation of Opticianry Schools, Ophthalmic Dispensing Program, J. Sargeant Reynolds Community College, P.O. Box 12084, Richmond, Va. 23241.

For general information about the occupation, contact:

International Union of Electrical, Radio and Machine Workers, 1126 16th St. NW., Washington, D.C. 20036.

Chairperson of Optical Council, IUE-AFL-CIO-CLC, 200 Park Ave. South, New York, N.Y. 10003.

Opticians Association of America, 1250 Connecticut Ave. NW., Washington, D.C. 20036.

# Patternmakers (Foundry)

(D.O.T. 600.280-050 and 661.281-022)

## Nature of the Work

Foundry casting is a process that forms metal into detailed objects by pouring molten metal into previously prepared molds and allowing it to harden in the mold cavity. A high quality product depends upon the initial pattern created by the foundry patternmaker. The formation of the hollow mold cavity, and ultimately the metal casting itself, relies upon an accurate, well-constructed pattern. Patterns are formed from many different materials—wood, metal, plastic, plaster, and even wax.

Patternmakers work from blueprints prepared by engineers or drafters. The blueprints contain information about the size, shape, and other properties desired in the finished cast object. From these instructions, patternmakers construct a precise pattern for the product by carefully checking each dimension with instruments such as micrometers and calipers. Precision is important because any imperfection in the pattern will be reproduced in the castings.

Most workers in this occupation are *metal patternmakers* (D.O.T. 600.280-050). These workers prepare patterns from metal stock or from rough castings made from a wood pattern. To shape and finish the patterns, they use many metalworking machines, including lathes, drill presses, shapers, milling machines, and grinders. To smooth surfaces, they also use small handtools, such as files and metal scrapers.

*Wood patternmakers* (D.O.T. 661.281-022) select the wood stock, lay out the pattern, and cut each piece of wood to size. They then shape the rough pieces into final form with various woodworking machines, such as lathes and sanders, as well as many small handtools. Finally, they assemble the pattern segments by hand, using glue, screws, and nails.

Other workers who have an important role in the foundry metal casting process are coremakers and molders. For a description of these jobs, see those statements elsewhere in this section.

## Working Conditions

Patternmakers work indoors in well-lighted, well-ventilated areas. The rooms in which they work generally are separated from the areas where the casting takes place, so they are not exposed to the heat and noise of the foundry floor. Although the work is not strenuous, patternmaking requires considerable standing and moving about.

## Employment

In 1980, about 3,000 patternmakers worked in foundries. Most foundries are small; more than 90 percent employ fewer than 250 workers, although several of the largest employ more than 5,000 workers.

Although foundries are located throughout the country, the largest are concentrated in areas that are readily accessible to raw materials. Some States that have considerable metalworking activity are Michigan, Ohio, Pennsylvania, Illinois, Indiana, Alabama, New York, California, and Wisconsin.

## Training, Other Qualifications, and Advancement

Apprenticeship is the best means of qualifying as an experienced patternmaker. Apprenticeship programs generally are sponsored jointly by the employer and the International Molders' and Allied Workers' Union. Because of the high degree of skill and the wide range of knowledge needed for patternmaking, it is difficult to learn the trade on the job, but with additional on-the-job training or experience, some skilled machinists have transferred to metal patternmaking. High school courses in mechanical drawing, blueprint reading, woodworking, metalworking, and shop mathematics are helpful to persons interested in becoming a patternmaker. In addition, vocational and technical school training in patternmaking, metalworking, and machining provide useful preparation for an apprentice, and may be credited toward completion of the apprenticeship.

The usual apprenticeship period for patternmaking is 4 or 5 years. At least 144 hours of classroom instruction generally accompany the work experience provided each year. Because of the precise skills needed, apprenticeship programs for wood and metal patternmaking are separate. Employers almost always require apprentices to have a high school education.

Apprentices begin by helping experienced patternmakers in routine duties. They make simple patterns under close supervision; as they progress, the work becomes increasingly complex and the supervision more general. Patternmakers earn higher pay as their skill increases, and some become supervisors.

Manual dexterity and attention to detail are especially important because of the precise

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Patternmakers must carefully check each dimension.

nature of the work. The ability to visualize objects in three dimensions also is important when reading blueprints.

## Job Outlook

Employment of foundry patternmakers is expected to increase more slowly than the average for all occupations through the 1980's despite anticipated increases in foundry production. The increased use of metal and plastic patterns will allow production to increase faster than employment. Because these patterns last longer than wooden ones, fewer patterns have to be made. Some job openings will arise because of the need to replace experienced patternmakers who retire, die, or transfer to other occupations.

The number of openings may fluctuate from year to year since the demand for many foundry products is sensitive to changes in the economy. About 400 pounds of metal castings go into the production of an automobile, for example. When economic conditions are poor, the demand for cars as well as other expensive durable goods that use metal casting is reduced. Thus, patternmakers may experience layoffs or shortened workweeks when users of foundry products face a reduction in the demand for their products.

## Earnings

Patternmakers generally have higher earnings than other production workers in manufacturing. In January 1980, average straight-time hourly earnings of patternmakers ranged from $7.50 in steel foundries to $9.50 in iron foundries, according to a wage survey made by the National Foundry Association. In comparison, all production workers in manufacturing industries averaged $7.27 an hour.

## Related Occupations

Because patternmakers learn either basic metalworking or woodworking, they may be able to use their skills and knowledge for jobs in related fields. Wood patternmakers, for example, may qualify for woodworking jobs such as cabinetmaker or bench carpenter. Metal patternmakers may be able to transfer to metalworking occupations such as machinist, layout worker, or sheet-metal worker.

Other workers who follow blueprints to construct full-sized and scale models of products include sample-body builders (automobile manufacturing), model makers (clocks and watches), form builders (aircraft-aerospace manufacturing), loft workers (ship and boat building and repairing), mock-up builders (transportation equipment), wood model makers (any industry), cabinetmakers (woodworking), and metal fabricators (any industry).

## Sources of Additional Information

For details about training opportunities for patternmakers, contact local foundries, the local office of your State employment service, the nearest office of the State apprenticeship agency, or the Bureau of Apprenticeship and Training, U.S. Department of Labor. Information also is available from:

International Molders' and Allied Workers' Union, 1225 E. McMillan St., Cincinnati, Ohio 45206.

Additional career guidance material—free when requested on stationery with a school letterhead—is available from:

American Foundrymen's Society/Cast Metals Institute, Golf and Wolf Rds., Des Plaines, Ill. 60016.

# Photoengravers

(D.O.T. 970.361-014; 971.261-010; .381-014 through -038; .382-014 through -018; .684-010; .685-010; and 979.381-018)

## Nature of the Work

Photoengravers make metal printing plates of pictures and other copy that cannot be set in type. In letterpress photoengraving, ink is rolled over a printing surface which stands higher than the rest of the plate. When paper is pressed against this raised surface, the print or image is picked up. Similarly, gravure photoengravers make gravure cylinders on which the image is etched below the surface of the cylinder. Ink is placed in the etched or sunken areas, and, when paper is pressed against the surface, the ink is lifted out and appears on the paper. In both methods, however, the work of photoengravers is the same.

For a typical letterpress job, photoengravers first mount the picture or copy to be reproduced on a board, adjust the position and focus of a camera, and take a picture. After developing the negative, they print its image on a flat, metal plate by coating the

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plate with a chemical solution sensitive to light, placing the negative on the plate, and exposing both to a bright light. As the final step in making the printing plate, photoengravers put the plate in an acid bath which eats the metal away from areas which will not be covered with ink. The areas to receive ink—those that were exposed to the light through the negative—stand out to make contact with the paper. The number of photoengraving operations performed depends on the quality of the printing required. Photoengravings for very high-quality books or periodicals, for example, require more careful finishing than those for newspapers. Photoengravers use handtools to inspect and touch up the plates. They cut away metal from the nonprinting part of the plate to prevent it from touching the inking rollers during printing.

In small shops, the entire photoengraving operation usually is done by one person. In large shops, however, the work is divided among specialists who perform a particular operation such as camera work, printing, or etching.

## Working Conditions

Photoengravers stand up most of the time but the work is not strenuous. Work areas generally have good light and ventilation. However, photoengravers who work with toxic chemicals may be exposed to skin irritations.

Photoengravers may have to work overtime to meet publication deadlines. Some work evening and night shifts. Photoengravers employed by newspapers frequently work weekends and holidays.

## Employment

About 10,000 skilled photoengravers were employed in 1980. More than half worked in commercial shops that make photoengravings for other printing firms. Newspapers and photogravure shops employed several thousand photoengravers. Book and magazine printers and the Federal Government also employ these workers. Many photoengravers have their own shops.

Although photoengravers are located in all parts of the country, employment is concentrated in large printing centers such as New York, Chicago, Philadelphia, Washington, D.C., and Los Angeles.

## Training and Other Qualifications

Most photoengravers learn their trade through a 4-year apprenticeship program that includes at least 800 hours of classroom instruction. In addition to the care and use of tools, apprentices are taught to cut and square negatives, inspect negatives for defects, mix chemicals, sensitize metals, and operate machines used in the photoengraving process. Many apprentices specialize in one aspect of photoengraving such as camera work, etching, finishing, or proofing.

Apprenticeship applicants must be at least 18 years of age and generally must have a high school or vocational school education or its equivalent, preferably with courses in printing, chemistry, and physics. Due to declining demand for photoengravers, however, very few apprenticeships have been offered in recent years. Some photoengravers have been retrained as lithographers. (See the statement on lithographers elsewhere in the *Handbook*.) Good eyesight and accurate color perception are particularly important because of the close work and color determinations involved.

## Job Outlook

Employment opportunities for photoengravers are expected to be limited in the years ahead. Despite the growing use of photographs and other illustrations in publications, employment of photoengravers will decline as firms continue to switch from letterpress to offset printing, which requires no photoengraving. Also, new technological advances, such as color scanners and color enlargers, and the trend toward automated platemaking should reduce the need for these workers. However, due to the expected growth in gravure printing, there should be some employment opportunities for gravure photoengravers. Some job openings are expected each year as experienced photoengravers retire, die, or change occupations.

## Earnings

Based on a survey of union wages, photoengravers on the day shift in newspaper plants earned an estimated average minimum rate of $11.58 an hour in 1980; photoengravers working the night shift receive extra pay. In 1980, the average hourly rate for all nonsupervisory and production workers in private industry, except farming, was $6.66.

## Related Occupations

Photoengravers are required to use artistic skills in their work. These skills also are essential for occupations such as sign painters, jewelers, decorators, engravers, and lithographers.

## Sources of Additional Information

Details about apprenticeship and other training opportunities may be obtained from local employers such as newspapers and printing shops, the local office of the union mentioned below, or the local office of the State employment service.

For general information on photoengravers, write to:

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

Graphic Arts International Union, 1900 L St. NW., Washington, D.C. 20036.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22201.

Photoengravers take pictures of the copy to be reproduced.

# Photographic Process Workers

(D.O.T. 962.665-010; 970.281-010; -018, .381-010, -034; 972.281-010, -018, 976.267-010 through .361-010, .381-014 through .564-014, .665-010 through .685-030, .687-014 through -022; 979.682-014)

## Nature of the Work

If the developing of film and printing of pictures were left to the photographer few photographs would be taken. Instead, professionals and amateurs alike generally rely on photographic process workers in photo finishing or custom photo labs to develop film, make prints and slides, and do related tasks such as enlarging and retouching photographs. (This statement does not discuss em-

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ployees of laboratories that specialize in processing professional motion picture film).

*All-round darkroom technicians* can do everything necessary to develop and print film. They vary the developing process according to the type of film—black-and-white negative, color negative, or color positive. For example, a developing process for black-and-white negative film covers five steps: Developer, stop bath, fixing bath, washing, and drying. The first three steps use chemical solutions and are performed in darkness. In a hand operation, the technician first immerses unwound film in the developer to bring out the image on exposed film. After a specified period, the technician transfers the film to a stop bath to prevent overdevelopment. Next, the film is placed in a fixing bath that makes it insensitive to light to prevent further exposure. Finally, the technician washes the film with water to remove the fixing solution and places the film in a drying cabinet. Although processing is done by hand in some small photographic studios, technicians in many photographic labs operate machines that automatically perform the steps described above.

Processing of color film is more complex than processing of black-and-white film. Thus, some labs employ *color-laboratory technicians* (D.O.T. 976.681-010)—highly skilled workers who specialize in processing color film.

The darkroom technician makes a photograph by transferring the image from a negative to photographic paper. Printing frequently is performed on a projection printer, which consists of a fixture for holding negatives and photographic paper, an electric lamp, and a magnifying lens. The technician places the negative between the lamp and lens, and the paper below the lens. When the technician turns on the lamp, light passes through the negative and lens and records a magnified image of the negative on the paper. During printing, the technician may vary the contrast of the image or remove unwanted background by using paper patterns to shade part of the photographic paper from the projected image. After removing the exposed photographic paper from the printer, the technician develops it in much the same way as the negative. If the customer desires, the technician mounts the finished print in a frame or on a paper or cardboard back.

In addition to working in the laboratory, darkroom technicians may set up lights and cameras or otherwise assist experienced photographers. Many technicians, particularly those in portrait studios who aspire to become professional photographers, divide their time between taking and processing pictures. In some labs, helpers assist technicians. Technicians also may be assisted by workers who specialize in a particular activity, such as *developers* (D.O.T. 976.681-010), *print washers* (D.O.T. 976.684-022), *projection printers* (D.O.T. 976.381-018), and *photograph retouchers* (D.O.T. 970.281-018).

In most large photo labs where film developing is largely automated, darkroom technicians supervise workers whose assignments require only a limited knowledge of developing and printing. Included are *photofinishing laboratory workers* (D.O.T. 976.687-018), who sort film according to the type of processing needed and number each roll for identification; *color-printer operators* (D.O.T. 976.382-014), who control the equipment used to produce color prints from negatives; *print controllers* (D.O.T. 976.685-010), who operate machines that expose rolls of photographic paper to negatives; *automatic print developers* (D.O.T. 976.685-026), who operate machines that develop rolls of exposed photographic paper; *cutters* (D.O.T. 976.685-010), who tend machines that cut processed film or prints into single or multiple units; *automatic mounters* (D.O.T. 976.685-022), who tend the automatic mounting presses that cut film into individual transparencies and seal them in mounting frames; and *photo checkers and assemblers* (D.O.T. 976.687-014), who inspect and package finished slides and prints for customers.

Most photo process workers learn their skills on the job.

## Working Conditions

Photo lab jobs are not physically strenuous and the work is done in clean, well-lighted, and air-conditioned photofinishing laboratories. However, many workers, especially in large laboratories, do repetitious work at a rapid pace. Some workers such as photo checkers and assemblers, who perform detailed tasks, are subject to eye fatigue.

Most photo lab employees work a 40-hour week. In labs that specialize in processing film for amateur photographers, employees may work a considerable amount of over-

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time, at premium pay, during peak seasons such as summer and after Christmas.

## Employment

About 77,000 persons were employed as photo process workers in 1980.

Most worked in large photofinishing labs that process film for amateur photographers. A large proportion of darkroom technicians work in photo labs operated by portrait and commercial studios and by manufacturers, newspaper and magazine publishers, advertising agencies, and other organizations. Darkroom technicians also work in commercial labs that specialize in processing the work of professional photographers.

Photo process workers are employed in all parts of the country but are concentrated in the more populous areas such as New York, Los Angeles, Chicago, and other large cities.

## Training, Other Qualifications, and Advancement

Most photo process workers learn their skills through informal on-the-job training. Beginners start as helpers and gradually learn to develop and print film by assisting experienced technicians. It generally takes about 3 years to become a fully qualified darkroom technician. Some helpers specialize in a particular activity, such as printing or developing. Generally, less training time is required to become a specialist than to become an all-round darkroom technician.

When hiring darkroom technician helpers, employers prefer applicants who are high school graduates. Courses in chemistry and mathematics are helpful to people interested in this field. Some high schools and trade schools offer courses in photography that include training in film processing. The Armed Forces also offer training in photographic processing. Experience gained through processing film as a hobby is helpful.

Several community colleges offer 2-year programs leading to an associate degree in photographic technology. Formal training also is available from vocational schools and technical institutes. Completion of postsecondary courses in this field is helpful to people who are interested in supervisory and managerial jobs in photo labs.

Some darkroom technicians eventually become professional photographers. (See the statement on photographers elsewhere in the *Handbook*). Others advance to supervisory positions in laboratories.

On-the-job training for workers in specialized photo process occupations ranges from a few weeks for film numberers and automatic mounters, for example, to several months for photo checkers and assemblers. For many jobs, manual dexterity, good vision including normal color perception, and good hand-eye coordination are important qualifications.

## Job Outlook

Employment of photo process workers is expected to increase more slowly than average through the 1980's. Increased demand will create some jobs, but most openings will result from replacement needs, which reportedly are high. Job prospects for photo process workers are associated to some extent with fluctuations in the business cycle; these workers are subject to layoff during economic downturns, when the volume of film processing declines.

The demand for film processing is expected to rise as a result of the expanding interest in amateur photography—spurred by rising population and personal income as well as improvements in still and movie cameras that make them easier to load and operate. Business and government also are expected to contribute to the demand for film processing through expanded use of photography in research and development activities and increased use of photographs to illustrate printed materials. Employment of photographic process workers is not expected to keep pace with the demand for film processing, however, because of the growing popularity of self-processing instant cameras and the automation of photo lab operations.

## Earnings

Earnings of photo process workers vary greatly depending on skill level, experience, and geographic location. Inexperienced photo process workers generally start at or just above the minimum wage, and earned between $3.40 and $4.50 an hour in 1980, according to the limited information available. Among workers in specialized occupations, printer operators and chemical mixers generally had the highest earnings. In general, darkroom technicians and those in supervisory positions earned more than specialized workers.

## Related Occupations

The more highly skilled photo process workers—all-round darkroom technicians and color-laboratory technicians, for example—need a specialized knowledge of the photodeveloping process. Other laboratory workers who apply specialized technical knowledge include chemical laboratory technicians, crime lab analysts, food testers, medical laboratory assistants, metallurgical technicians, and quality control technicians.

## Sources of Additional Information

For information about employment opportunities in photographic laboratories and schools that offer degrees in photographic technology, write to:

Photo Marketing Association International, 3000 Picture Place, Jackson, Mich. 49201.

# Shoe Repairers

(D.O.T. 365.361-014, 753.684-026, and 788.381-010)

## Nature of the Work

People like their shoes to look nice and feel comfortable. Keeping them that way is the job of the shoe repairer. Using their knowledge of shoe construction and leatherworking, shoe repairers give worn shoes a new lease on life.

Replacing soles and heels is the most common type of shoe repair. Repairers place the shoe on a last, a block shaped like a foot. They remove the old sole and heel with a knife and pincers. To prepare the shoe for the new sole, repairers rough the shoe's bottom by holding it against a sanding wheel. Repairers then cement to the shoe a piece of leather or rubber that will be the new sole. They hammer the new sole so it adheres to the shoe, and cement or stitch it in place. To form the new sole, repairers cut off the excess material with a trimming machine and smooth the edge against a sanding wheel. To reheel the shoe, repairers select a precut replacement heel or cut one to shape and cement and nail it in place. New soles and heels are stained and buffed to match the color of the shoe.

Shoe repairers also replace insoles, restitch loose seams, and restyle old shoes by changing heels or dyeing uppers. Highly skilled repairers may design, make, or repair orthopedic shoes according to doctors' prescriptions. Repairers also may mend handbags, luggage, tents, and other items made of leather, rubber, or canvas. They also replace zippers, dye handbags, and stretch shoes to conform to the foot.

In large shops, repair work sometimes is divided into a number of specialized tasks. For example, some of the repairers only remove and replace heels and soles; others only restitch torn seams.

Shoe repairers use a variety of power-operated equipment, such as sole-stitchers, heel-nailing machines, and sewing machines. Among the handtools they use are hammers, knives, awls, nippers, and skivers (a special tool for splitting pieces of leather).

Self-employed shoe repairers have managerial responsibilities in addition to their regular duties. They have to maintain good relations with their customers; decide whether to sell items such as shoe polish and leather goods; keep business records; and supervise other repairers, helpers, and cashiers.

## Working Conditions

Because many shoe repairers own shops, working conditions often are determined by the repairer. Shops are usually comfortable, but some may be crowded and noisy and have poor lighting or ventilation. There may be strong odors from leather goods, dyes, and stains. The work is not strenuous and hazards are few. However, stamina is needed because repairers must stand much of the time.

## Employment

About 16,000 shoe repairers were employed in 1980. Almost one-half of all shoe repairers work in their own shoe-repair shops; many of the shops are small, one-person operations. Most of the remaining

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Most shoe repairers work alone.

repairers work in larger shoe repair shops. Some repairers work in shoe stores, department stores, and drycleaning shops. A small number are employed in shoe manufacturing, to repair shoes damaged in production. These workers generally are less skilled than those who work in repair shops. Shoe repairers are employed throughout the country. Employment, however, is concentrated in large cities.

## Training, Other Qualifications, and Advancement

Shoe repairers learn their trade on the job as helpers to experienced repairers, or in vocational programs. Helpers begin by assisting experienced repairers with simple tasks, such as removing soles and heels and staining, brushing, and shining shoes. As they gain experience, trainees learn to replace heels and soles, to estimate the cost of repairs, and to deal with customers. Helpers usually become fully skilled in 6 months to 2 years; the length of training varies greatly with the individual.

Twenty-four vocational training programs are available nationwide. This training is offered at high schools, private vocational schools, junior colleges, and government facilities. Applicants to shoe repair programs at junior colleges usually must have a high school diploma. In vocational classes, students study shoe construction and practice different types of shoe repair. Students also attend classes in business administration. The programs last from 6 months to 2 years. Graduates often are encouraged to gain additional training by working with experienced shoe repairers. Graduates of vocational programs may be preferred by employers over people with no experience or training.

Shoe repairers must have manual dexterity and mechanical aptitude to work with various machines and handtools. They must have self-discipline because they often work alone with little supervision. In addition to being skilled craftworkers, repairers who own shops must have a working knowledge of business administration, marketing, and accounting.

Many shoe repairers open their own shops. Some who are employed in large shops become supervisors.

## Job Outlook

Employment of shoe repairers is expected to grow more slowly than the average for all occupations through the 1980's. Nevertheless, job opportunities are expected to be good for people with some training in shoe repair because of the need to replace experienced shoe repairers who retire, die, or leave the field for other reasons. However, training is difficult to obtain since there are few vocational training programs and inexperienced workers often have difficulty finding a job as a helper in a repair shop.

For many years, employment of shoe repairers declined because shoes were relatively inexpensive and many people bought new shoes instead of having old ones fixed. The popularity of cushion-soled footwear and other casual shoes which usually are not practical to repair also limited the demand for these workers. The rising cost of shoes, however, should stimulate the demand for repairs.

## Earnings

Shoe repairers earned about $200 a week in 1980, according to the limited information available. Some managers and owners of shoe repair shops earned more than $300 a week.

Shoe repairers often work more than 40 hours a week. The workweek is sometimes 10 hours a day, 6 days a week.

## Related Occupations

Other occupations in which workers make or repair items using leather and cloth are alterations tailors, furniture upholsterers, furriers, luggage repairers, rug repairers, saddlemakers, and custom shoemakers.

## Sources of Additional Information

Information about the shoe repair business and training opportunities may be obtained from:

Shoe Service Institute of America, 154 W. Hubbard St., Chicago, Ill. 60610.

Information about work opportunities is available from State employment service offices, as well as shoe shops and shoe service wholesalers in the community.

# Tool-and-Die Makers

(D.O.T. 601.280, .281-010, -014, and -026; .380-010; .381-010, -014, -022, -026, -030, and -034)

## Nature of the Work

Tool-and-die makers are highly skilled, creative workers whose products—tools, dies, and special guiding and holding devices—are used by other machining workers to mass-produce metal parts. Toolmakers produce jigs and fixtures (devices that hold metal while it is bored, stamped, or drilled). They also make gauges and other measuring devices used in manufacturing precision metal parts. Diemakers construct metal forms (dies) to shape metal in stamping and forging operations. They also make metal molds for diecasting and for molding plastics. Tool-and-die makers also repair worn or damaged dies, gauges, jigs, and fixtures, and aid in the design of tools and dies.

Compared with most other machining workers, tool-and-die makers have a broader knowledge of machining operations, mathematics, and blueprint reading. Like machinists, tool-and-die makers use almost every type of machine tool and precision measuring instrument. Because they work with all the metals and alloys commonly used in manufacturing, tool-and-die makers must be familiar with the machining properties, such as hardness and heat tolerance, of a wide variety of metals and alloys.

## Working Conditions

Tool-and-die makers usually work in "toolrooms," which are in an area of the plant separated from the production floor. Toolrooms usually are quieter than the production floor because there are not as many machines in use at one time.

Because of the danger from flying pieces of hot metal, tool-and-die makers must follow strict safety procedures when working around metal-cutting machines. Safety glasses with side shields and other protective clothing must be worn. In addition, loose or

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billowy clothing, long hair, and rings or other jewelry are prohibited.

## Employment

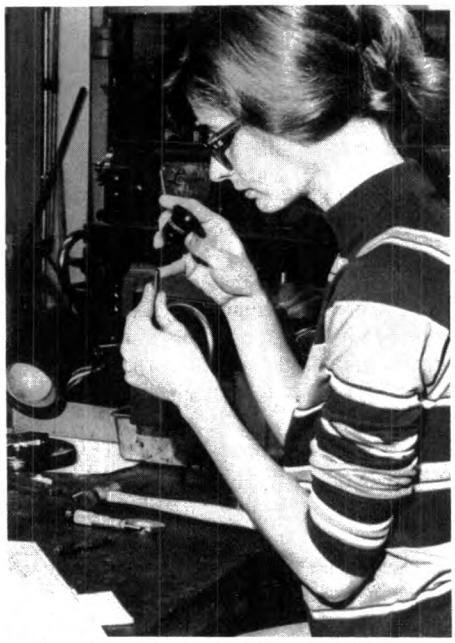
About 166,000 tool-and-die makers were employed in 1980. Most worked in plants that produce manufacturing, construction, and farm machinery. Others worked in automobile, aircraft, and other transportation equipment industries; small tool-and-die shops; and electrical machinery and fabricated metal industries.

Although tool-and-die makers are situated throughout the country, jobs are most plentiful in areas where many large factories are located. About one-fifth of all tool-and-die makers work in the Detroit and Flint, Chicago, and Los Angeles areas, which are major manufacturing centers for automobiles, machinery, and aircraft, respectively. Among the other areas that have large numbers of these workers are Cleveland, New York, Newark, Dayton, and Buffalo.

## Training, Other Qualifications, and Advancement

Tool-and-die makers obtain their skills in a variety of ways, including formal apprenticeship, vocational school, and on-the-job training. Formal apprenticeship programs, however, are probably the best way to learn the trade.

In selecting apprentices, most employers prefer persons with a high school or trade school education. Applicants should have a good working knowledge of algebra, geometry, trignometry, and physics, as well as considerable mechanical ability, finger dexterity, and an aptitude for precise work. Some employers test apprentice applicants to determine their mechanical aptitudes and their mathematical ability.



Tool-and-die makers are in great demand.

Most of the 4 years of a tool-and-die apprenticeship are spent in practical shop training. Apprentices learn to operate the drill press, milling machine, lathe, grinder, and other machine tools. They also learn to use handtools in fitting and assembling tools, gauges, and other mechanical equipment, and study heat treating and other metalworking processes. Classroom training consists of shop mathematics, shop theory, mechanical drawing, tool designing, and blueprint reading. Several years of experience after apprenticeship are often necessary to qualify for more difficult tool-and-die work. Some companies have separate apprenticeship programs for toolmaking and diemaking.

Some machining workers become tool-and-die makers without completing formal apprenticeships. After years of experience as skilled machine tool operators or machinists, plus additional classroom training, they develop into skilled all-round workers who can make tools and dies.

Skilled tool-and-die makers have numerous paths for advancement. Some advance to supervisory and administrative positons in industry. Some become tool designers and others may open their own tool-and-die shops.

## Job Outlook

Employment of tool-and-die makers is expected to increase more slowly than the average for all occupations through the 1980's. Most openings will occur as experienced tool-and-die makers transfer to other occupations, retire, or die.

The long-range expansion in metalworking industries will result in a continued need for tools and dies. The growth of this occupation will be limited, however, by the use of electrical discharge machines and numerically controlled machines that have significantly changed toolmaking processes. Numerically controlled machining operations require fewer of the special tools and jigs and fixtures and could increase the output of each tool-and-die maker. Despite relatively slow growth in demand, there is a shortage of tool-and-die makers because training programs have not trained enough people in recent years. Opportunities, therefore, should be excellent for those with the proper training and experience.

The extensive skills and knowledge of tool-and-die makers can be acquired only after many years of experience. Because of this, these workers are able to change jobs within the machining occupations more easily than less skilled workers. Tool-and-die makers produce industrial machinery rather than consumer durable goods. Because of the lengthy lead-time involved in making this equipment, their jobs are less sensitive to fluctuations in the business cycle than most other occupations. Employers are quite reluctant to lay off these highly skilled workers even when production levels fall because they fear the workers will not be available when economic conditions improve.

## Earnings

Tool-and-die makers are among the highest paid machining workers. In 1980, tool-and-die makers employed in metropolitan areas had average earnings of $10.34 an hour. This was about one and three-fourths times as much as the average for all nonsupervisory workers in private industry, except farming. Average hourly rates in 13 of the areas surveyed, selected to show how wage rates for tool-and-die makers differ in various parts of the country, appear in table 1.

**Table 1. Average hourly earnings of tool-and-die makers in selected areas, 1980**

| Area | Hourly rate |
|---|---|
| San Francisco–Oakland | $12.34 |
| Detroit | 11.33 |
| Cleveland | 10.66 |
| Chicago | 10.55 |
| Atlanta | 10.47 |
| Baltimore | 10.35 |
| Cincinnati | 10.15 |
| Houston | 9.98 |
| Minneapolis–St. Paul | 9.76 |
| Boston | 9.39 |
| New York | 8.77 |
| Hartford | 8.59 |
| Birmingham | 8.27 |

SOURCE: Bureau of Labor Statistics.

Many tool-and-die makers are members of unions, including the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; and the United Steelworkers of America.

## Related Occupations

The occupations most closely related to tool-and-die maker are, of course, the other machining occupations. These include all-round machinists, instrument makers, machine tool operators, machine tool setup workers, and machine tool programmers.

Other occupations that require precision and skill in working with metal include arc cutters, blacksmiths, gunsmiths locksmiths, patternmakers (metal), and welders.

## Sources of Additional Information

See the list under this same heading in the statement on all-round machinists elsewhere in the *Handbook*.

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# Plant and Systems Operators

The workers described in this section of the *Handbook* operate, maintain, and repair machinery in industrial plants and systems. They monitor and control equipment that ranges in complexity from the boiler in the basement of an apartment building to the technologically advanced equipment in nuclear power and chemical plants and petroleum refineries.

Water and sewage treatment plant operators run equipment that purifies and distributes water for human use, as well as disposes of liquid wastes, such as chemical and radioactive wastes. Gas plant operators handle machinery that processes and distributes gas to business and residential customers. Power plant operators control machinery that provides energy for industry, and for such purposes as lighting, heating, refrigeration, ventilation, and air-conditioning. Hydroelectric plants, nuclear reactors, powerhouses, and diesel plants are included in this group. Other plant and systems operators include chemical plant operators and petroleum plant operators.

Plants and systems vary in size, complexity, and degree of automation; some are run by only one operator at a time, while others require many. Operators tend to have certain tasks in common, however. They start up equipment and shut it down; monitor meters, gauges, or control panels; and make adjustments. They may operate switches that control the flow of various materials and substances; take samples and run tests; keep records (of instrument readings and switching operations, for example); and do calculations. Operators also are responsible for periodic inspection and maintenance.

Some plant and systems operators control equipment that is highly automated and very expensive. Their jobs are responsible ones, and require technical skill. As recent events have shown, accidents in places such as nuclear power plants can have very serious consequences indeed. Training requirements for operators have risen as industrial equipment has become more sophisticated. In the past, many operators started out as laborers or helpers and were trained on the job. Currently, however, formal training is increasingly important. Such training is available from vocational-technical institutes, community and 2-year colleges, apprenticeship programs, the Armed Forces, employers, and government agencies. Certain plant and systems operators must hold a license or certificate. Detailed information on the training needed for two of these occupations appears in the statements that follow.

## Stationary Engineers

(D.O.T. 221.362-014; 914.167-014, .362-018, and .382-010 and -022; 950.362, 382-018, -022, -026, and 030, and .585; 952.362-010, -042, and .382-010; 953.362-010, -014, and .382-010; 954.382; and 955.382-018)

### Nature of the Work

Stationary engineers operate, maintain, and repair the machinery that provides mechanical and electrical power for industry. They are also responsible for the equipment that heats, air-conditions, refrigerates, and ventilates factories and other buildings. The equipment they tend and control includes boilers, diesel engines, turbines, generators, pumps, condensers, and compressors.

Stationary engineers start up and shut down equipment in order to meet demands for power and to ensure the equipment is operating within established limits. They monitor meters, gauges, and other instruments that are attached to equipment and make adjustments whenever necessary. They also keep a log of all relevant facts about the operation and maintenance of the equipment. On a steam boiler, for example, they observe, control, and keep records of steam pressure, temperature, water level, power output, and the amount of fuel consumed. Stationary engineers control the flow of fuel to the boiler and the steam pressure by adjusting throttles, valves, or automatic controls.

Stationary engineers must periodically remove from equipment the soot and corrosion that can reduce operating efficiency. To limit further corrosion, they test boiler water for purity and treat it with chemicals.

These workers detect, identify, and correct any trouble that develops. They watch and listen to their machinery and routinely check safety devices. Often stationary engineers use hand or power tools to make repairs, ranging from a complete overhaul to replacing defective valves, gaskets, or bearings.

In a large plant, the stationary engineer may be in charge of the powerplant or engine room and direct the work of assistant stationary engineers, turbine operators, boiler tenders, and air-conditioning and refrigeration operators and mechanics. In a small plant, the stationary engineer may be the only person operating and maintaining equipment.

### Working Conditions

Stationary engineers generally have steady year-round employment. They usually work a 5-day, 40-hour week. In plants that operate around the clock, they may be assigned to any one of three shifts—often on a rotating basis—and to Sunday and holiday work.

Engine rooms, powerplants, or boiler rooms usually are clean and well lighted. Even under the most favorable conditions, however, some stationary engineers are exposed to high temperatures, dust, dirt, and high noise levels from the equipment. General maintenance duties may cause contact with oil and grease, and fumes or smoke. Workers are on their feet a lot; they also may have to crawl inside boilers and work in crouching or kneeling positions to inspect, clean, or repair equipment.

Because stationary engineers work around boilers and electrical and mechanical equipment, they must be alert to avoid burns, electric shock, and injury from moving machinery.

### Employment

In 1980, 147,000 stationary engineers were employed in a wide variety of places, including power stations, factories, sewage and water treatment plants, office and apartment buildings, shopping malls, hotels, and hospitals. Usually, plants that operate on three shifts employ four to eight stationary engineers, but some have more. In many plants, only one engineer works on each shift.

Because stationary engineers work in so many different kinds of industries, they are employed in all parts of the country. Although some are employed in small towns and in rural areas, most work in the more heavily populated areas where large industrial and commercial businesses are located.

### Training, Other Qualifications, and Advancement

Many stationary engineers start as helpers or oilers and acquire their skills through informal on-the-job experience. A good background also can be obtained in the Navy or Merchant Marine. However, most training authorities recommend formal apprenticeship programs because of the increasing complexity of the machines and systems; programs are sponsored by the International Union of Operating Engineers and the International Brotherhood of Firemen and Oilers.

In selecting apprentices, most local labor-management apprenticeship committees prefer high school or trade school graduates who have received instruction in mathematics, mechanical drawing, machine-shop practice, physics, and chemistry. Mechanical aptitude, manual dexterity, and good physical condition also are important qualifications.

The apprenticeship usually lasts 4 years. In addition to on-the-job training, apprentices



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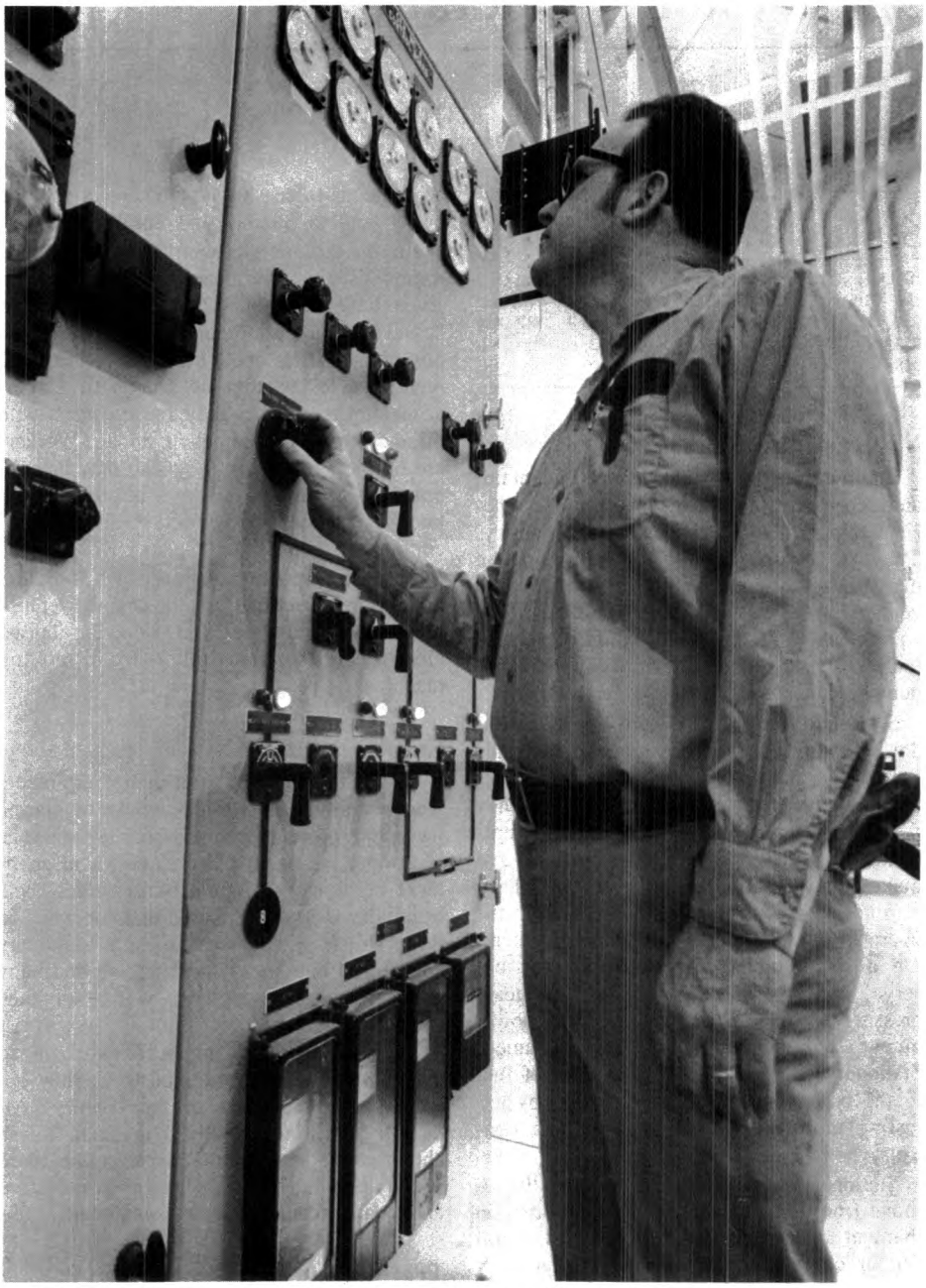

Stationary engineers monitor machinery to make sure it is running smoothly.

receive classroom instruction in practical chemistry, elementary physics, blueprint reading, applied electricity, instrumentation, electronics, and other technical subjects.

Becoming a stationary engineer without going through a formal apprenticeship program usually takes many years of experience as an assistant to a licensed stationary engineer or as a boiler tender. This practical experience can be supplemented by technical or other school training or home study.

Many States, the District of Columbia, and many cities have licensing requirements for stationary engineers. Although requirements for a license differ from place to place, applicants usually must be at least 18 years of age, reside for a specified period in the State or locality in which the examination is given, meet the experience requirements for the class of license requested, and pass a written examination.

Generally, there are several classes of stationary engineer licenses. Each class specifies the steam pressure or horsepower of the equipment the engineer can operate without supervision. The first class license permits the stationary engineer to operate equipment of all types and capacities. An applicant for this license may be required to have a high school education and an approved apprenticeship or on-the-job training. The lower class licenses limit the capacity of the equipment the engineer may operate without the supervision of a higher rated engineer.

Because of regional differences in licensing requirements, a stationary engineer who moves from one State or city to another may have to pass an examination for a new license. However, the National Institute for Uniform Licensing of Power Engineers has helped 21 States adopt a standardized licensing program that eliminates this problem by establishing reciprocity of licenses.

Stationary engineers advance to more responsible jobs by being placed in charge of larger, more powerful, or more varied equipment. Generally, engineers advance to these jobs as they obtain higher class licenses. Advancement, however, is not automatic. For example, an engineer who has a first-class license may work for some time as an assistant to another first-class engineer before a vacancy occurs. Some stationary engineers eventually advance to jobs as plant engineers and as building and plant superintendents. A few obtain jobs as examining engineers and technical instructors.

## Job Outlook

Despite an expanding economy that will require more mechanical and electrical power, employment of stationary engineers is expected to grow more slowly than the average for all occupations through the 1980's. Most job openings will arise because of the need to replace experienced workers who transfer to other occupations, retire, or die.

Some employment growth is expected as rising fuel costs force employers to look for ways to increase efficiency. A growing number of small plants that have been operated automatically are hiring a licensed engineer to cut their fuel consumption. In addition, large plants are being encouraged to generate more of their own electricity in order to reduce the demands placed on overburdened public utilities, and this will require more stationary engineers.

## Earnings

Stationary engineers had average hourly earnings of $9.42 in 1980, according to a survey of metropolitan areas. This was almost 40 percent higher than the average for all nonsupervisory workers in private industry, except farming. Average earnings for engineers in individual cities ranged from $6.33 in the Greenville-Spartanburg, S.C., metropolitan area to $11.32 in the Detroit, Mich., metropolitan area.

The principal unions to which these workers belong are the International Union of Operating Engineers and the International Brotherhood of Firemen and Oilers.

## Related Occupations

Other workers involved with monitoring and operating stationary machinery include nuclear reactor operators, power station operators, wastewater treatment plant operators, waterworks pump-station operators, chemical operators, and refinery operators.

## Sources of Additional Information

Information about training or work opportunities is available from local offices of State employment services, locals of the International Union of Operating Engineers, and from State and local licensing agencies.

Specific questions about the occupation may be referred to:

International Union of Operating Engineers, 1125 17th St. NW., Washington, D.C. 20036.

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National Association of Power Engineers, Inc., 176 West Adams St., Chicago, Ill. 60603.

For questions concerning licensing requirements, contact:

National Institute for Uniform Licensing of Power Engineers, 1436 Fritz Rd., Verona, Wis. 53593.

# Wastewater Treatment Plant Operators (Sewage Plant Operators)

(D.O.T. 955.362-010 and .585-010)

Wastewater treatment plant operators sometimes repair equipment.

## Nature of the Work

Clean water is essential for many things: Our health and recreation; the existence of fish and wildlife; and the functioning of many industries. Wastewater treatment plant operators, sometimes referred to as sewage plant operators, help keep America's water clean by removing harmful domestic and industrial waste. In a sense, they manufacture clean water out of dirty water.

Waste materials are carried by water through sewer pipes to treatment plants. Operators control processes and equipment to remove these materials or render them harmless. These waste materials include organic and inorganic solids, some of which are toxic, such as lead and mercury. By operating and maintaining the pumps, pipes, valves, and processing equipment of the treatment facility, operators move the wastewater that comes from the collection system through the various treatment processes.

Operators read and interpret meters and gauges to make sure plant equipment and processes are working properly. Other jobs include operating chemical-feeding devices; taking samples of the wastewater and performing chemical and biological laboratory analyses; and testing and adjusting the level of chlorine in the wastewater. Operators also make minor repairs on valves, pumps, and other equipment. They use gauges, wrenches, pliers, and other common handtools, as well as special tools. Occasionally operators must work under emergency conditions. A heavy rainstorm, for example, may cause an abnormal amount of wastewater to flow into sewerpipes which might exceed a plant's treatment capacity. Emergencies also can be caused by conditions inside a plant, such as chlorine gas leaks or oxygen deficiencies.

The duties of operators vary depending on the type and size of plant. In smaller plants, one operator may be responsible for the entire system—making repairs, keeping plant records, handling complaints, and doing the maintenance work for the facility. In larger plants, the staff may include chemists, engineers, laboratory technicians, mechanics, helpers, supervisors, and a superintendent.

Water pollution standards have become increasingly stringent since adoption of the Federal Water Pollution Control Act of 1972. To implement the law, a national system of uniform controls on the discharge of pollutants was set in motion. Under the 1972 law, as amended by the Clean Water Act of 1977, it is illegal for any industry to discharge any pollutant without a permit. Industrial facilities that send their wastes to municipal treatment plants must meet certain minimum standards and insure that these wastes have been adequately pretreated so that they do not damage municipal treatment facilities. Municipal treatment plants must also meet discharge standards. In order to meet these requirements, operators will have to be able to operate more sophisticated systems.

## Working Conditions

Wastewater treatment plant operators work both indoors and outdoors and may be exposed to noise from machinery and unpleasant odors, although chlorine and other chemicals are used to minimize these. Persons with allergies might suffer due to dust and other substances in the air. Because plants operate around the clock, operators are required to work shifts and on weekends and holidays. During emergencies, overtime is common. Operators have to stoop, reach, and climb and often get their clothes dirty. Sometimes they are confronted with hazardous conditions, such as slippery walkways, dangerous gases, and malfunctioning equipment.

## Employment

About 41,000 persons worked as wastewater treatment plant operators in 1980. The vast majority worked for local governments; the rest worked for the Federal Government, utilities, and sanitary services. In 1980, almost 900 wastewater treatment plant operators were employed by the Federal Government, mostly by the Armed Forces.

Wastewater treatment plant operators are employed throughout the country. Geographically, employment is distributed much like the Nation's population, with most jobs in larger towns and cities. Many operators in small towns are employed part time or handle additional duties.

## Training, Other Qualifications, and Advancement

Trainees usually start as attendants or operators-in-training and learn their skills on the job under the direction of an experienced operator. They learn by observing the processes and equipment in operation and by doing routine tasks such as recording meter readings; taking samples of wastewater and sludge; and doing simple maintenance and repair work on pumps, electric motors, and valves. They also are expected to perform housekeeping tasks such as cleaning and

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maintaining plant equipment and property. Some of the larger treatment plants have more formal "in-house" training programs.

Persons interested in entering the field should have some mechanical aptitude and should be competent in basic mathematics. Employers generally prefer trainees who have a high school diploma or its equivalent. In some States this is a minimum educational requirement. Some positions, particularly in larger cities and towns, are covered by civil service regulations, and applicants may be required to pass written examinations testing elementary mathematics skills, mechanical aptitude, and general intelligence. Operators must be agile, since they have to climb ladders and move easily around heavy machinery.

Some 2-year programs leading to an associate degree in wastewater technology and 1-year programs leading to a certificate are available; these provide a good general knowledge of water pollution control as well as basic preparation for becoming an operator. Because plants are becoming more complex, completion of such courses increases an applicant's chances for employment and promotion.

Most State water pollution control agencies offer training courses to improve the skills and knowledge of treatment plant operators. These courses cover principles of treatment processes and process control, odors and their control, safety, chlorination, sedimentation, biological oxidation, sludge treatment and disposal, and flow measurements. Some operators take correspondence courses on subjects related to wastewater treatment, and some employers will pay part of the tuition for courses leading to a college degree in science or engineering.

Operators may be promoted to positions such as supervisor and superintendent. A high school diploma and increasingly responsible experience as an operator may be sufficient to qualify for superintendent of a small plant, since at many small plants the superintendent also serves as an operator. However, educational requirements are rising as larger, more complex treatment plants are built to meet new water pollution control standards. Superintendents of large plants are expected to have an engineering or science degree. Training in management techniques is becoming increasingly important for operators seeking supervisory positions. A few operators get jobs as technicians with State water pollution control agencies; they monitor and provide technical assistance to plants throughout the State. Vocational-technical school or community college training generally is preferred for technician jobs. Experienced operators may transfer to related jobs with industrial wastewater treatment plants, companies selling wastewater treatment equipment and chemicals, engineering consulting firms, or vocational-technical schools.

In 44 States, supervisors and certain operators must pass an examination to certify that they are capable of overseeing treatment plant operations. Voluntary certification programs are in effect in the remaining States. Typically, there are different classes of certification for different sizes of treatment plants.

## Job Outlook

Employment of wastewater treatment plant operators is expected to grow more slowly than the average for all occupations through the 1980's, due to an anticipated slowdown in the rate of construction of new treatment plants as well as in modernization of existing ones. While some new jobs will be created from the limited expansion of wastewater treatment, most job openings will occur as experienced operators transfer to other occupations, retire, or die. Operators with formal training will have the competitive edge in securing new positions or advancing to higher level positions.

People who enter this field should enjoy steady employment because treatment of water pollutants is a continuous operation and, therefore, plants seldom lay off employees—even during economic downturns.

## Earnings

According to a survey conducted by the Water Pollution Control Federation, average annual salaries of wastewater treatment plant operators ranged from $11,800 to $14,300 in 1980. Some experienced operators earned as much as $23,000 a year. Salaries depend, among other things, on the size of the plant, the complexity of the operator's job, and the operator's level of certification. Salaries for trainees were about 90 percent of operators' salaries. Average yearly salaries of supervisors of wastewater treatment plants ranged from $13,700 to $18,200, while those of superintendents ranged from $18,900 to $21,900. The Federal Government paid wastewater treatment plant operators an average salary of about $18,000 a year in 1980. In early 1981, the Federal Government paid these operators starting salaries of approximately $17,400 a year.

## Related Occupations

Other workers whose main activity consists of operating a system of machinery to process or produce materials include boiler operators, gas-compressor operators, power-plant operators, power-reactor operators, stationary engineers, turbine operators, and waterworks pump-station operators.

## Sources of Additional Information

*Environmental Protection Careers Guidebook*, a 1980 publication of the U.S. Department of Labor and the U.S. Environmental Protection Agency, contains a list of post-secondary environmental education programs (including wastewater programs), a chapter on water treatment occupations, and other useful information. It is available for $7.50 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

For further information on training, contact:

National Environmental Training Association, 158 S. Napoleon St., P.O. Box 346, Valparaiso, Ind. 46383.

For information on certification, contact:

Association of Boards of Certification, Municipal Building, Ames, Iowa 50010.

Additional information is available from:

Water Pollution Control Federation, 2626 Pennsylvania Ave. NW., Washington, D.C. 20037.

For information on job opportunities, contact State or local water pollution control agencies or local offices of the State employment service.

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# Machine Operators, Tenders, and Setup Workers

The workers included in this cluster set up, adjust, operate, and tend numerous kinds of machinery and equipment. These workers generally have job titles related to the type of machine they handle such as rolling machine setup operator, printing press operator, sewing machine operator, and motion picture projectionist.

Skilled machine setup operators adjust the speed, feed, and other controls on machines according to the specifications of a particular product or job. They then test the machines to make certain they are functioning properly and producing parts that conform to job specifications. After this determination has been made, semiskilled machine operators begin production. It is their job to control and monitor machines and equipment and make necessary adjustments during production.

In small establishments, workers may perform a wider range of tasks than in large establishments, where workers' duties may be more specialized. Some skilled workers may set up, operate, and tend equipment throughout the production process.

The accompanying table shows 1980 estimated employment for selected occupations in this type of work.

**Table 1. Employment in selected machine operator, tender, and setup occupations, 1980**

| Occupation | Employment |
|---|---|
| Sewing machine operator, garment | 689,000 |
| Punch press operator, metal | 183,000 |
| Sewing machine operator, nongarment | 177,000 |
| Machine tool operator, combination | 171,000 |
| Lathe machine operator, metal | 157,000 |
| Grinding and abrading machine operator, metal | 131,000 |
| Drill press and boring machine operator | 124,000 |
| Offset lithographic press operator | 81,000 |
| Milling and planing machine operator | 72,000 |
| Laundry presser, machine | 68,000 |
| Machine washer and starcher | 59,000 |
| Machine tool setter, metalworking | 56,000 |
| Electroplater | 37,000 |
| Weaver | 35,000 |
| Spinner, frame | 31,000 |
| Heat treater, annealer, and temperer | 25,000 |
| Yarn winder | 20,000 |
| Motion picture projectionist | 19,000 |

SOURCE: Bureau of Labor Statistics.

Most machine operators, tenders, and setup workers are employed in factories in the mass production of goods. Working conditions in factories have improved substantially in recent years. The use of modern equipment and safety procedures has reduced the rate of accidents. Most factories are clean and well-lighted and some modern factories are air-conditioned. However, many workers must perform their jobs under rather unpleasant conditions. For example, electroplaters and boiler tenders may be exposed to fumes. Forge shops can be very hot and noisy. And working around even the most modern high-speed machines can still be dangerous.

Some machine operators such as motion picture projectionists work in nonmanufacturing industries where the injury rate is much lower than in manufacturing industries. Because of the repetitive nature of some tasks, machine operators, tenders, and setup workers may find their jobs tedious and boring.

Persons interested in these jobs should have manual dexterity and be mechanically inclined to use the tools and machinery required in their work. Physical stamina is important because many machine operators, tenders, and setup workers, such as production painters, must stand for long periods of time and do a considerable amount of reaching and bending. Physical strength is essential for jobs such as printing press operator and electroplater which require some heavy lifting and carrying. Precision, accuracy, and the ability to visualize three-dimensional objects from drawings also are important characteristics for many of these workers.

Many jobs as machine operators, tenders, and setup workers do not require a high school diploma. However, employers often prefer high school or vocational school graduates who have taken courses in mathematics, machine shop, and blueprint reading.

Most workers learn these jobs through on-the-job training provided by their employers. Skilled workers, such as machine tool setup workers, often complete formal apprenticeship programs. Some experienced workers may be required to take courses to keep abreast of new technologies.

This section of the *Handbook* includes statements on selected machine operators, tenders, and setup workers. In addition to more detailed information on the nature of the work, employment, working conditions, and training requirements, these statements discuss job outlook and earnings.

## Boiler Tenders

(D.O.T. 542.562-010; 553.682-010 and -022; .685-030, -086, -090, and -094; 558.382-014, .482-010, and .685-054; 559.585-022 and .662-010; 563.382-010 and .682-010; 572.360-010; 573.362-010; 950.382-010; 951.685-010 and 014, and .686-010)

### Nature of the Work

Boiler tenders operate and maintain the steam boilers that power industrial machinery and heat factories, offices, and other buildings. They also may operate waste-heat boilers that burn trash and other solid waste.

Boiler tenders control the mechanical and or automatic devices that regulate the flow of air and fuel into the combustion chambers. They may, for example, start the pulverizers or stokers to feed coal into the firebox or start the oil pumps and heaters to ignite burners or sequence the safe burning of natural gas.

These workers inspect and maintain boiler equipment. Their work includes monitoring meters and gauges attached to the boilers to ensure safe operation. Sometimes boiler tenders make minor repairs, such as packing valves or replacing indicators.

Boiler tenders also chemically test and treat water for purity to prevent corrosion of the boiler and buildup of scale.

Boiler tenders generally work under the supervision of licensed stationary engineers. (Information on stationary engineers appears elsewhere in the *Handbook*.)

### Working Conditions

Modern boiler rooms usually are clean and well lighted. However, boiler tenders may be exposed to noise, heat, grease, fumes, and smoke, and may have to work in awkward positions. They also are subject to burns, falls, and injury from defective boilers or moving parts, such as pulverizers and stokers. Modern equipment and safety procedures, however, have reduced accidents.

### Employment

Almost one-half of the 62,000 boiler tenders employed in 1980 worked in factories. Plants that manufacture lumber, iron and steel, paper, chemicals, and stone, clay, and glass products are among the leading employers of boiler tenders. Many others work in hospitals, schools, and office and apartment buildings. A large number also work in government agencies.

Although boiler tenders are employed in all parts of the country, most work in the more heavily populated areas where large industrial and commercial establishments are located.

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## Training, Other Qualifications, and Advancement

Some large cities and a few States require boiler tenders to be licensed. An applicant can obtain the knowledge and experience to pass the license examination by first working as a helper in a boiler room. Applicants for helper jobs should be in good physical condition and have mechanical aptitude and manual dexterity. High school courses in mathematics, motor mechanics, chemistry, and blueprint reading also are helpful to persons interested in becoming bóiler tenders.

There are two types of boiler tenders' licenses—for low-pressure and high-pressure boilers. Tenders with licenses for low-pressure boilers operate boilers generally used for heating buildings. Tenders of high-pressure boilers operate the more powerful boilers and auxiliary equipment used to power machinery in factories as well as heat large buildings, such as high-rise apartments. However, tenders may operate equipment of any pressure if a licensed stationary engineer is on duty.

Due to regional differences in licensing requirements, a boiler tender who moves from one State or city to another may have to pass an examination for a new license. However, the National Institute for Uniform Licensing of Power Engineers is currently assisting many State licensing agencies in adopting uniform licensing requirements that would establish reciprocity of licenses.

Boiler tenders may advance to jobs as stationary engineers. To help them advance, they sometimes supplement their on-the-job training by taking courses in chemistry, physics, blueprint reading, electricity, and air-conditioning and refrigeration. Boiler tenders also may become maintenance mechanics.

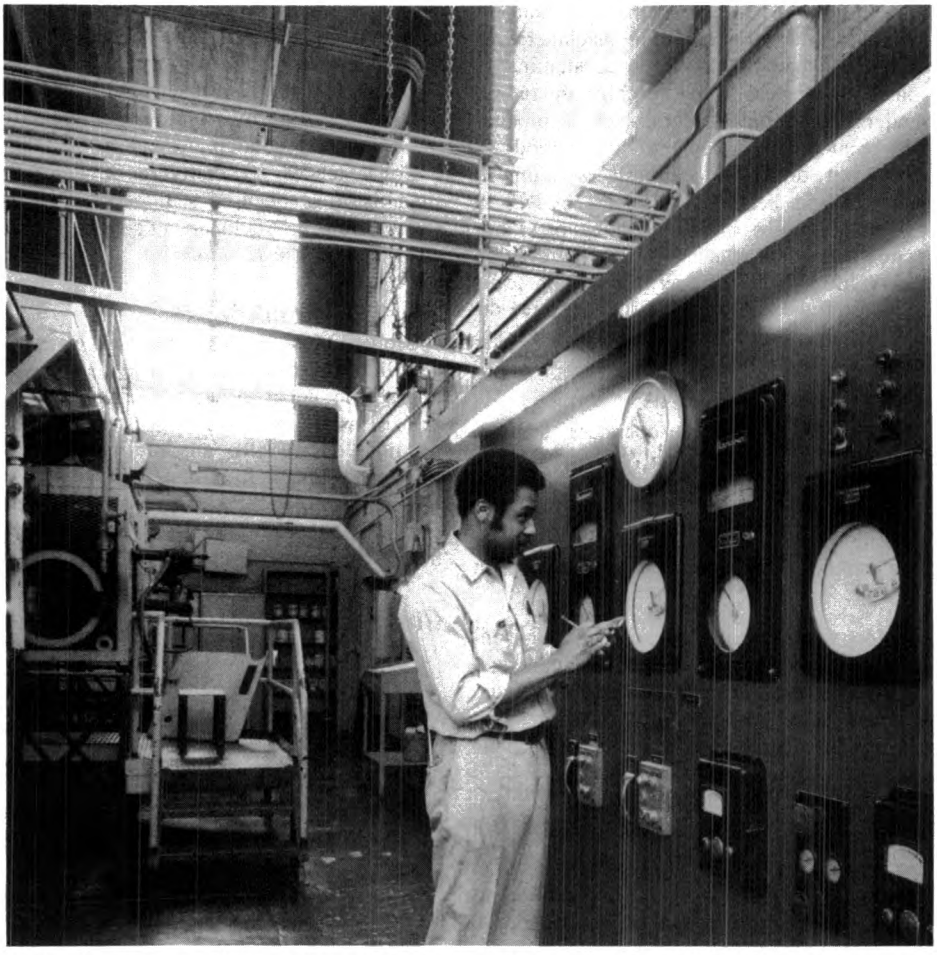
## Job Outlook

Little change in employment of boiler tenders is expected through the 1980's as more new boilers are equipped with automatic controls. Nevertheless, many openings will result each year from the need to replace experienced tenders who transfer to other occupations, retire, or die.

## Earnings

Boiler tenders had average hourly earnings of $8.14 in 1980, according to the available data. This was higher than the average for all nonsupervisory workers in private industry, except farming. The average for tenders ranged from $5.26 in the Chattanooga, Tenn.—Ga. metropolitan area to $10.24 in Cleveland, Ohio.

The principal unions to which boiler tenders belong are the International Brotherhood of Firemen and Oilers and the International Union of Operating Engineers.



Boiler tenders monitor equipment that generates power for industrial machinery and residential heating.

## Related Occupations

Boiler tenders monitor and check steam boiler equipment which generates power for industrial machinery. Others whose work requires a similar background and related duties are oilers, operating engineers, power engineers, and stationary engineers.

## Sources of Additional Information

Information about training or work opportunities in this trade is available from local offices of State employment services, locals of the International Brotherhood of Firemen and Oilers, locals of the International Union of Operating Engineers, and from State and local licensing agencies.

Specific questions about the nature of the occupation, training, and employment opportunities may be referred to:

National Association of Power Engineers, Inc., 176 West Adams St., Chicago, Ill. 60603.

International Union of Operating Engineers, 1125 17th St. NW., Washington, D.C. 20036.

# Electrotypers and Stereotypers

(D.O.T. 974.381-010 and .382-014)

## Nature of the Work

Electrotyping and stereotyping are rapidly being replaced by more technologically advanced printing processes. *Electrotypers* and *stereotypers* make duplicate pressplates of metal, rubber, and plastic. These plates are made from the metal type forms prepared in the composing room. Electrotype is used mainly in book and magazine work. Stereotype, which is less durable, is used chiefly for newspapers. Electrotyping and stereotyping are used for volume printing which requires the use of duplicate plates. When a large edition of a magazine or newspaper is printed, several plates must be used to replace those that become too worn to make clear impressions. Also, by having duplicate plates, printers can use several presses at the same time and finish a big run quickly. Furthermore, many big plants use rotary presses, which require curved plates made by either electrotyping or stereotyping from flat type forms.

Electrotypers make a wax or plastic mold of the metal type form. They coat the mold with chemicals and place it into an electrolytic bath that puts a metallic shell on the coated mold. They then strip the shell from the mold and fill the back of the shell with molten lead to form a plate. After removing excess metal from the edges and back of the plate, they inspect the plate for any defects.

The stereotyping process is simpler, quicker, and less expensive than electrotyping, but it does not yield as durable or as fine a plate. Stereotypers make molds or mats of paper-mache instead of wax or plastic. The mat is placed on

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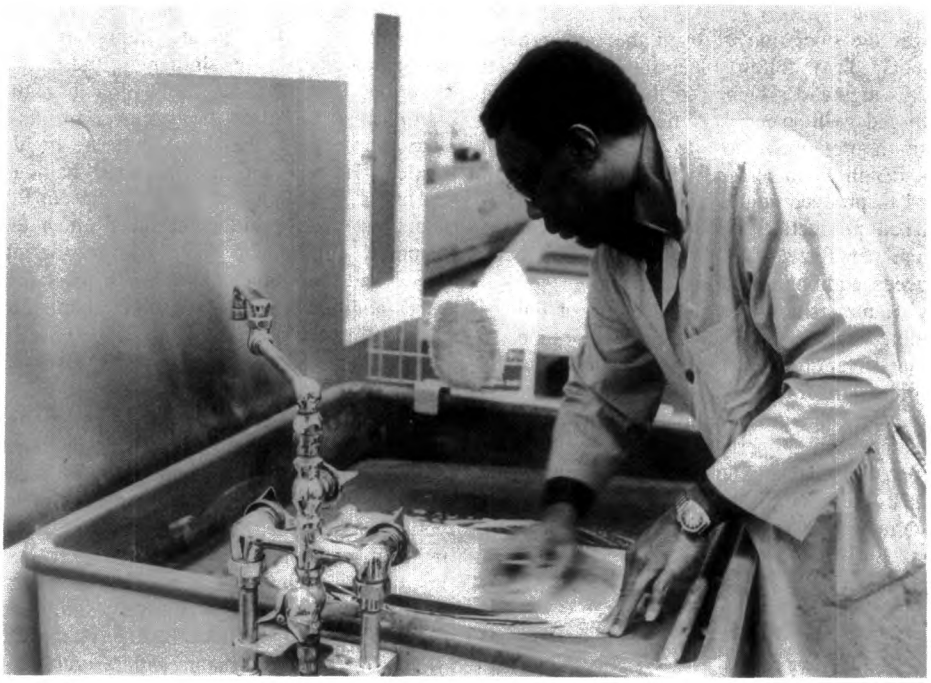

Most stereotypers work for newspapers.

the type form and covered with a cork blanket and a sheet of fiberboard. The covered form is run under heavy steel rollers to impress the type and photoengravings on the mat. Then the mat is placed in a stereotype casting machine which casts a composition lead plate on the mold. In many of the larger plants, automatic machines cast stereotype plates.

Some electrotypers and stereotypers do only one phase of the work, such as casting, molding, or finishing. Others handle many tasks.

## Working Conditions

Most work in these trades requires little physical effort since the preparation of duplicate printing plates is highly mechanized. However, some lifting of relatively heavy pressplates occasionally is required. Electrotypers who work with toxic chemicals may be exposed to skin irritations.

Some electrotypers and stereotypers work evening and night shifts. Others may have to work overtime to meet publication deadlines. Stereotypers employed by newspapers frequently work weekends and holidays.

## Employment

About 1,900 electrotypers and stereotypers were employed in 1980. Many electrotypers work in large plants that print books and magazines. Most stereotypers work for newspaper plants, but some work in large commercial printing plants. Electrotypers and stereotypers also are employed in service shops that do this work for printing firms.

Jobs in these trades can be found throughout the country, but employment is concentrated in larger printing centers such as New York, Los Angeles, Philadelphia, Washington D.C., and Chicago.

## Training and Other Qualifications

Nearly all electrotypers and stereotypers learn their trades through 4-year apprenticeships. Electrotyping and stereotyping are separate crafts and relatively few transfers take place between the two. The apprenticeship program for each trade covers all phases of the work and almost always includes classes in related technical subjects as well as training on the job. However, due to the decline in demand for electrotypers and stereotypers, apprenticeships have not been offered in the last several years. Many experienced electrotypers and stereotypers are now being retrained as offset plate makers and press operators.

## Job Outlook

Job opportunities for electrotypers and stereotypers are expected to be scarce through the 1980's. Despite the anticipated increase in the volume of printing, employment of electrotypers and stereotypers is expected to decline because of laborsaving developments. For example, automatic plate casting eliminates many steps in platemaking. The use of plastic printing plates also requires less labor because such plates are more durable and reduce the demand for duplicate plates. Furthermore, the greater use of offset printing will eliminate the need for electrotype and stereotype plates.

## Earnings

Based on a 1980 survey of union wages, estimated average minimum hourly rates were $9.80 for electrotypers and $10.37 for stereotypers in book and commercial printing shops. In 1980, the average hourly rate for all nonsupervisory and production workers in private industry, except farming, was $6.66.

Nearly all electrotypers and stereotypers are members of the International Printing and Graphic Communications Union.

## Related Occupations

Electrotypers and stereotypers make molds of metal type. Other workers who make molds or cores are molders, coremakers, and electroplaters.

## Sources of Additional Information

Details about apprenticeship and other training opportunities may be obtained from local employers such as newspapers and printing shops, the local office of the International Printing and Graphic Communications Union, or the local office of the State employment service.

For general information on electrotypers and stereotypers, write to:

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

International Printing and Graphic Communications Union, 1730 Rhode Island Ave. NW., Washington, D.C. 20036.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22209.

# Forge Shop Occupations

Forging is one of the oldest methods of working and shaping metals. Many machined items that must withstand heavy wear, such as wrenches, drill bits, and parts for automobiles and airplanes, are forged because forged metal parts are exceptionally strong when subjected to constant stress and pressure.

The simplest forging method is hand forging done by a blacksmith. To forge products in greater quantities, modern forge shops substitute heavy power equipment and dies (tools that shape metal) for the blacksmith's hammer and anvil. Five employees operating a large forging machine can turn out more forgings in an hour than five blacksmiths can make in a year!

Most forgings are steel; but aluminum, copper, brass, bronze, and other nonferrous metals also are forged. Nonferrous forgings are useful in many critical applications, such as aircraft landing gear, which require resistance to corrosion and a lighter weight to strength ratio.

Forged products may be as small and lightweight as a key, or as bulky and heavy as a large piece of industrial machinery.

## Nature of the Work

Before metal can be shaped, it must be heated to a very high temperature in a furnace (forge) until it is workable. Workers place the heated metal between two metal dies that are attached to power presses or hammers. With tremendous force, the hammers or presses pound or squeeze the metal into the desired shape. Other workers trim rough edges and excess metal and perform

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other finishing operations such as heat treating and polishing.

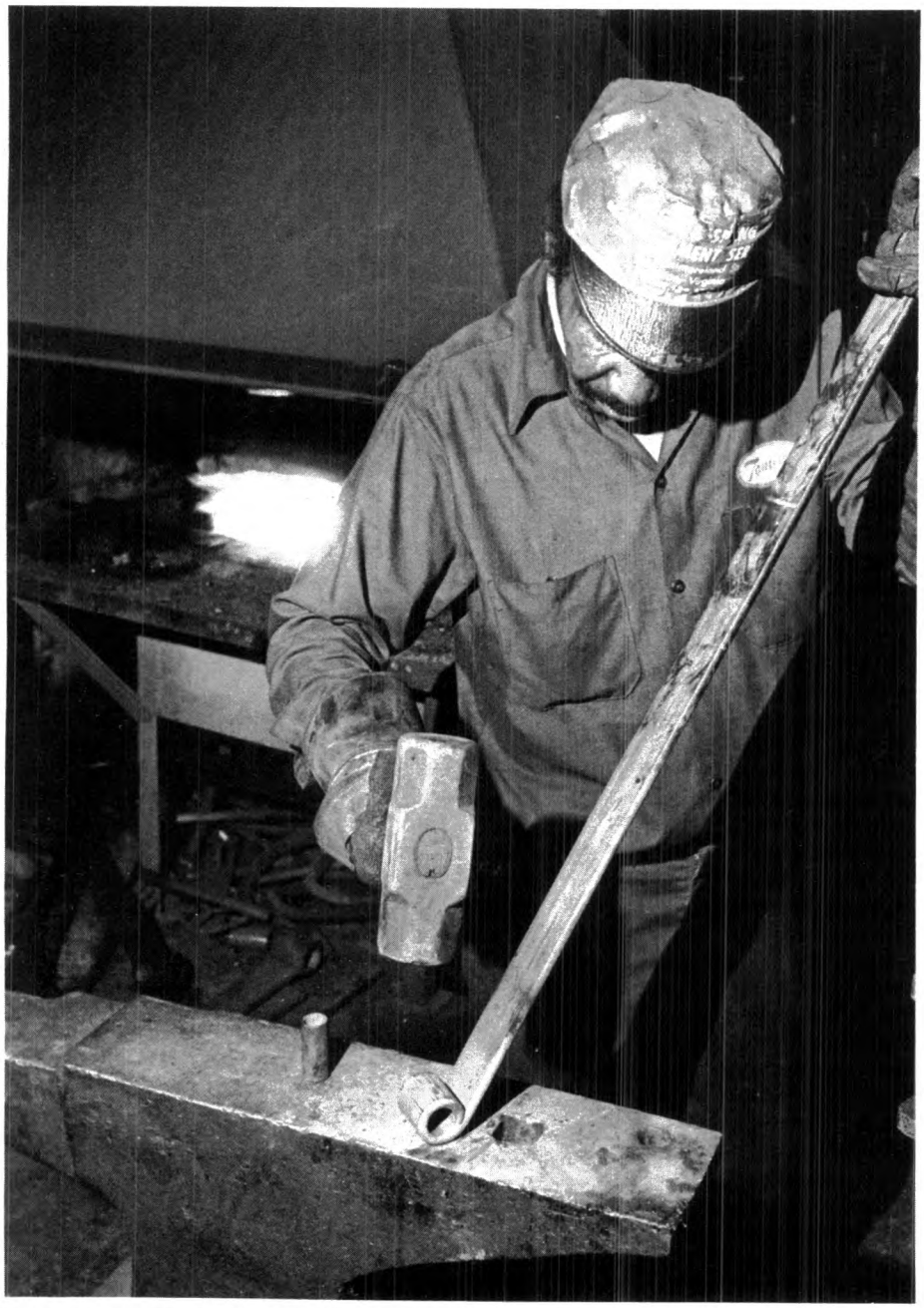
Two basic kinds of dies are used. The open die, which is flat and similar to the blacksmith's hammer, is generally used to produce limited quantities of forgings or large-size, simple-shaped forgings. The impression, or closed die, has a cavity shaped to the form of the metal part, and is used to produce large quantities of identical forgings.

Basic forge shop equipment consists of various types of hammers, presses, dies, upsetters, and furnaces. Forge shop workers also use handtools, such as hammers, tongs and punches, to help mold and shape parts to fit exact specifications. Measuring devices such as rules, scales, and calipers are needed to inspect the finished products.

Descriptions of some major forge shop production occupations follow.

*Hammersmiths* (D.O.T. 612.361-010) direct the operation of open die power hammers. They follow blueprints and interpret drawings and sketches so that the part being forged will meet specifications. Hammersmiths determine how to position the metal under the hammer and which tools are needed to produce angles and curves for the finished product. They decide the amount of hammer force and if and when the metal needs additional heating.

Hammersmiths may head crews of four or more workers. A typical crew includes a hammer driver or hammer runner who regulates the force of the forging blow; a crane operator who transfers the metal from the furnace to the hammer and properly places it under the hammer; and a heater who controls the furnace that heats the metal to correct temperatures. One or more helpers assist as needed.



Forge shop workers must wear safety equipment to prevent injury.

The duties of *hammer operators* (D.O.T. 610.462-010) who operate impression die power hammers, are similar to those just described for hammersmiths. Because the parts forged by closed die hammers are intricate and detailed, these operators are highly skilled. Helpers and heaters assist hammer operators in setting and aligning dies in the hammers. They position the metal under the hammer, control the force of the forging blow, and determine if and when the metal needs additional heating for easier shaping to the die impression.

*Press operators* (D.O.T. 611.482-010 and .685-010) control huge presses equipped with either impression or open dies. These machines press and squeeze rather than hammer or pound the hot metal, and operators regulate machine pressure and move the hot metal between the dies. They also may control metal heating operations. Some workers use instruments such as squares and micrometers to set dies. Their skills are very similar to those of hammersmiths or hammer operators.

With the help of heaters and several helpers, *upsetters* (D.O.T. 611.462-010) operate machines that shape hot metal by applying vertical or horizontal pressure. The heads of nails and bolts, for example, are made by upset forging.

*Heaters* (D.O.T. 619.682-022) control furnace temperatures. They determine when the metal has reached the correct temperature by observing the metal's color and the furnace's temperature gauge. Using tongs or mechanical equipment, they transfer the hot metal from the furnace to hammers or presses. Some heaters clean furnaces.

*Inspectors* (D.O.T. 612.261-010) examine forged pieces for accuracy, size, and quality. They use tools such as gauges, micrometers, squares, and calipers to measure the exact dimensions of the forgings. Machines that test strength and hardness and electronic testing devices also may be used.

*Die sinkers* (D.O.T. 601.280-022) make impression dies for forging hammers and presses. Working from a blueprint, drawing, or template, these skilled workers outline the object to be forged on two matching steel blocks. They measure and mark the object's shape in the blocks to form the impression cavity by using milling machines and other machine tools such as EDM (electrical discharge machinery) and ECM (electrical chemical machinery). Using handtools such as scrapers and grinders, and measuring tools such as calipers and micrometers, die sinkers smooth and finish the die cavity to fit specifications. Finally, a sample is prepared from the finished cavity and is checked against specifications.

Many forge shop workers clean and finish forgings. For example, *trimmers* (D.O.T. 615.685-030) remove excess metal with presses equipped with trimming dies. *Grinders* (D.O.T. 705.484-010 and -014) remove rough edges with power abrasive wheels. *Sandblasters* or *shotblasters* (D.O.T. 503.687-010) operate equipment that cleans

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and smoothes forgings by blasting them with a mixture of air and metal shot or grit. *Picklers* (D.O.T. 503.685-030) dip forgings in an acid solution to remove surface scale and reveal any surface defects. *Heat treaters* (D.O.T. 504.682-010 and -018) heat and then cool forgings to harden and temper the metal.

## Working Conditions

Forge shop occupations are more hazardous than most manufacturing occupations. However, improved machinery and shop practices have reduced the noise and vibration. For example, many forge shops have heat deflectors and ventilating fans to reduce heat and smoke. Also, labor and management cooperate to encourage good work practices through safety training and the use of protective equipment such as face shields, ear plugs and muffs, safety glasses, safety shoes, helmets, and machine safety guards.

Although cranes are used to move very large objects, forge shop workers must be strong enough to lift and move heavy forging and dies. They also need stamina and endurance to work in the heat and noise of a forge shop.

## Employment

In 1980, about 46,000 production workers were employed in forge shops. Although forge shop workers are found in all areas, they are concentrated near steel-producing centers that provide the steel for forgings, and near metalworking plants that are the major users of forged products. Large numbers of forge shop workers are employed in and around Detroit, Chicago, Cleveland, Los Angeles, Houston, and Pittsburgh.

## Training, Other Qualifications, and Advancement

Most forge shop workers learn their skills on the job. They generally join hammer or press crews as helpers or heaters, and progress to other jobs as they gain experience. Advancement to hammersmith, for example, frequently requires several years of on-the-job training and experience.

Some forge shops offer apprenticeship training programs for skilled jobs such as diesinker, heat treater, hammer operator, hammersmith, and press operator. These programs usually last 4 to 6 years, and offer classroom training and practical experience in metal properties, power hammer and furnace operation, handtool use, and blueprint reading.

Training for inspectors varies. Only a few weeks of on-the-job training are necessary for those who examine forgings visually or use only simple gauges. Inspectors who meet more complex and detailed specifications may receive several months' training in blueprint reading and mathematics.

Employers generally prefer high school graduates. Mechanical drawing, blueprint reading, graphics, and mathematics (especially geometry) as well as any courses that offer machining or shopwork training are helpful.

## Job Outlook

Employment of forge shop production workers is expected to increase more slowly than the average for all occupations through the 1980's. Some new jobs will become available because of growth in demand for forge shop products, but most openings will arise as experienced workers retire, die, or transfer to other fields of work.

Employment will grow because of expansion in industries that use forgings, particularly aerospace and energy-related industries. Many drilling bits and other forged products will be needed for oil drilling and coal mining operations. However, employment will not keep pace with forge shop production because improved forging techniques and equipment will result in greater output per worker.

Employment in some forge shops is sensitive to changes in economic conditions. In shops that make automobile parts, for example, employment fluctuates with changes in the demand for new cars; thus, jobs in these shops may be plentiful in some years, scarce in others. Forge shop workers may experience layoffs or shortened workweeks when the demand for forged products is reduced.

## Earnings

Average hourly earnings of forge shop production workers are higher than the average for all manufacturing production workers. In 1980, production workers in iron and steel forging plants averaged $9.27 an hour, compared to $7.27 for production workers in all manufacturing industries.

Many forge shop workers are union members and belong to the International Brotherhood of Boilermakers, Iron Shipbuilders, and Blacksmiths. Others are members of the United Steelworkers of America; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the International Association of Machinists and Aerospace Workers; and the International Die Sinkers' Conference (Ind).

## Related Occupations

Occupations most closely related to forging occupations are, of course, other forge shop occupations. Other workers who need precision and skill to work with metal include welders, blacksmiths, arc cutters, machinists, tool-and-die makers, and metal patternmakers.

## Sources of Additional Information

For information on employment opportunities in forging, contact local offices of the State employment service, personnel departments of forge shops, locals of the labor organizations listed above, or:

The Forging Industry Association, 55 Public Square, Cleveland, Ohio 44113.

# Machine Tool Operators

(D.O.T. 602., 603., 604., 605., and 606.)

## Nature of the Work

Machine tool operators use machine tools such as lathes, drill presses, milling machines, grinding machines, and punch presses to shape metal to precise dimensions. Although some operators can work with a wide variety of machine tools, most specialize in one or two types.

Operators fall into two broad skill categories—semiskilled and skilled. Semiskilled operators are essentially machine tenders who perform simple, repetitive operations that can be learned relatively quickly. Skilled operators can perform varied and complex machining operations. Both skilled and semiskilled operators have job titles related to the kind of machine they operate, such as milling machine operator and drill press operator.

Most machine tool operators fall into the semiskilled category. Their jobs vary according to the type of machine they work with; however, there are many tasks common to most machine tools. Typically, semiskilled operators place rough metal stock in a machine tool on which the speeds and operation sequence already have been set by skilled workers. (See the statement on machine tool setup workers elsewhere in the *Handbook*). By using special, easy-to-use gauges they watch one or more machines and make minor adjustments according to their instructions. However, they depend on skilled machining workers for major adjustments when their machines are not working properly.

The work of skilled machine tool operators is similar to that of all-round machinists, except that it usually is limited to only one type of machine and involves little or no hand fitting or assembly work. Skilled machine tool operators plan and set up the correct sequence of machining operations according to blueprints, layouts, or other instructions. They adjust speed, feed, and other controls, and select the proper cutting instruments or tools for each operation. Using micrometers, gauges, and other precision measuring instruments, they compare the completed work with the tolerance limits given in the specifications. They also may select cutting fluids to keep the metal workpiece from getting too hot, and lubricants to keep the machine tools running smoothly.

## Working Conditions

Most machine shops are clean, well lighted, and well ventilated. Noise levels have been reduced with the introduction of better designed machine tools. However, some machine tools, such as screw machines, are still very noisy. To combat this noise, operators often wear earmuffs or earplugs. Coolants (the liquids used to reduce friction) are well

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Most machine tool operators learn their skills on the job.

contained on modern machine tools, but operators of older machine tools sometimes have to stand on slippery floors caused by spilled coolants.

Powerful, high-speed machine tools can be dangerous if strict safety rules are not observed. Machine tool operators must wear safety glasses and other devices to protect themselves from flying metal particles. They cannot wear loose-fitting clothes or jewelry as these might get caught in the machine, injuring the operator or damaging the machine.

## Employment

About 1,020,000 machine tool operators were employed in 1980. Most worked in factories that produce fabricated metal products, transportation equipment, and machinery in large quantities. Skilled machine tool operators also worked in production departments, maintenance departments, and toolrooms.

Machine tool operators work in every State and in almost every city in the United States. They are concentrated, however, in major industrial areas such as the Great Lakes region. About one-fourth of all machine tool operators work in the Great Lakes cities of Detroit, Flint, Chicago, Cleveland, and Milwaukee. Among the other areas that have large numbers of these workers are Los Angeles, Philadelphia, St. Louis, and Indianapolis.

## Training, Other Qualifications, and Advancement

Most machine tool operators learn their skills on the job. Beginners usually start by observing experienced operators at work. Later they learn to use measuring instruments and to make elementary computations needed in shopwork. When trainees first operate a machine, they are supervised closely by more experienced workers. After gaining some experience themselves, beginners often take over more of the duties associated with the tools they operate. For example, they may learn to adjust feed speeds and cutting edges, instead of calling upon other workers to perform these tasks. Some also may learn to read blueprints and plan the sequence of machining work.

Individual ability and effort largely determine the time required to become a machine tool operator. Most semiskilled operators learn their jobs in a few months, but becoming a skilled operator often requires 1 to 2 years. Some companies have formal training programs for new employees.

Although no special education is required for semiskilled jobs, persons seeking such work can improve their opportunities by completing courses in mathematics and blueprint reading. In hiring beginners, employers often look for persons with mechanical aptitude and some experience working with machinery. Physical stamina is important since much time is spent standing. Applicants should be able to work independently. They also should not mind working in a relatively small workspace. Although much of the work is repetitive, many machine tool operators derive satisfaction from seeing the results of their work.

Skilled machine tool operators may become all-round machinists, tool-and-die makers, or advance to jobs in machine programming and maintenance.

## Job Outlook

Job opportunities for machine tool operators should be fairly plentiful in the years ahead. Employment in the occupation is expected to increase about as fast as the average for all occupations through the 1980's. In addition to openings arising from growth in demand for these workers, many thousands of openings are expected to occur each year in this large occupation as operators transfer to other fields of work, retire, or die.

More machine tool operators will be needed as metalworking industries expand their output. However, the use of faster and more versatile automatic machine tools and numerically controlled machine tools will result in greater output per worker and tend to limit employment demand. Other factors that may slow growth in this occupation are new processes in metalworking, such as electrical discharge and ultrasonic machining, and the use of powdered metals that reduce the need for final machining on some products.

The number of openings may fluctuate greatly from year to year due to changes in economic conditions. When demand for the factory's products slackens, production runs may be stopped or restricted, and workers

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may be laid off or may face a shortened workweek.

Workers with thorough backgrounds in machining operations, mathematics, blueprint reading, and a good working knowledge of the properties of metals will be better able to adjust to the changing job requirements that will result from technological advances.

## Earnings

Machine tool operators are paid according to hourly or incentive rates, or by a combination of both methods. Highly skilled operators in metropolitan areas had estimated hourly earnings of $10.20 in 1980. This compares favorably with the average for nonsupervisory workers in private industry, except farming. Average hourly rates in 10 of the areas surveyed, selected to show how wage rates of machine tool operators differ in various parts of the country, appear in table 1.

**Table 1. Average hourly earnings of machine tool operators in selected areas, 1980**

| Area | Hourly rate |
|---|---|
| Detroit | $11.29 |
| Cleveland | 10.62 |
| Chicago | 9.84 |
| St. Louis | 9.61 |
| Cincinnati | 9.46 |
| Milwaukee | 9.44 |
| Baltimore | 8.99 |
| Minneapolis–St. Paul | 8.78 |
| Hartford | 7.94 |
| Boston | 7.58 |

SOURCE: Bureau of Labor statistics.

Most machine tool operators belong to unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the International Union of Electrical, Radio and Machine Workers; the International Brotherhood of Electrical Workers; and the United Steelworkers of America.

## Related Occupations

The occupations most closely related to machine tool operators are, of course, the other machining occupations. These include all-round machinists, machine tool setup workers, tool-and-die makers, and instrument makers.

Other occupations that require precision and skill in working with metal include arc cutters, blacksmiths, gunsmiths, locksmiths, patternmakers (metal), and welders.

## Sources of Additional Information

See the list under this same heading in the statement on all-round machinists elsewhere in the *Handbook*.

# Machine Tool Setup Workers

(D.O.T. 600.360-010, .380-010, -014, -022; 603.280-034, .360-010, .380-010; 604.360-010; 609.280-010, .380-014; 612.360-010; 615.280-010, .380-010; 616.260-018, .360-022, .380-010; 619.380-014; and 692.260-010)

## Nature of the Work

Machine tools used in shops that do machining in large volume often are both very large and very complex. Setup workers, often called machine tool job setters, are skilled workers who specialize in preparing these tools to operate efficiently. Most setup workers work on only one type of machine, such as a drill press or lathe. However, some set up several different machines.

Before they begin preparing a machine for use, setup workers consult blueprints, written specifications, or job layouts. From these they can determine how fast the material can be fed into the machine, operating speeds, and the order in which the machine will perform its operations. They then select and install the proper cutting tools and adjust guides, stops, and other controls to insure that the machine will repeat its cycle accurately.

After setting up the machine, they usually make a trial run to be sure that it is running smoothly and producing parts that conform to specifications. When they are sure the machine is functioning properly, they explain to semiskilled machine operators how to run the machine and how to be sure that the machine's output meets specifications. They then turn the machine over to the semiskilled operators to begin production.

Set-up workers prepare machine tools for use by operators.

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## Working Conditions

Generally, working conditions are good for these workers. Most machine shops are clean, well lighted, and well ventilated. Many modern shops are air-conditioned. In those shops where noise is a problem, setup workers must wear earmuffs or earplugs to protect their hearing.

Serious work accidents are not common, but machine tools and flying metal particles may cause finger, hand, and eye injuries. To prevent such accidents, setup workers must follow certain safety rules. Safety glasses and other protective devices must be worn and loose clothing, jewelry, and long hair are prohibited.

Setup workers encounter some dangers that other machining workers do not. Die setters, for example, may have to place their hands inside a press when they are preparing the machine for use. A machine tool operator could not do this as the guard rails would be in place.

## Employment

In 1980, about 93,000 setup workers were employed in factories that manufactured fabricated metal products, transportation equipment, and machinery. Most worked for large companies that employed many semiskilled machine tool operators. Setup workers usually are not employed in maintenance shops or in small jobbing shops.

Setup workers are found in every State. However, employment is concentrated in major industrial areas such as Los Angeles, Philadelphia, New York, Chicago, Detroit, and Cleveland.

## Training, Other Qualifications, and Advancement

Setup workers must meet the same qualifications as all-round machinists. They must be able to operate one or more kinds of machine tools and select the sequence of operations so that metal parts will be made according to specifications. The ability to communicate clearly is important in explaining the machining operations to semiskilled workers. Setup workers may advance within a shop to supervisory jobs or transfer into other jobs, such as parts programmer or production planner.

## Job Outlook

Employment of setup workers is expected to increase about as fast as the average for all occupations through the 1980's. Although consumer and industrial demand for machined goods will grow, partly offsetting this will be greater productivity of setup workers due to the increasing use of numerically controlled machined tools. In these machine tools, operating sequences, feed speeds, tool selection, and other functions are controlled by a computer. Most job opportunities will arise from the need to replace experienced workers who transfer to other occupations, retire, or die.

Employment of setup workers should remain stable from year to year because this occupation is not particularly sensitive to changes in the economy. The impact of a drop in consumer demand will be felt more by setup workers who produce consumer goods than by those who produce machinery and industrial products. Employers are very reluctant to lay off these highly skilled workers when production falls because they are afraid the workers will no longer be available when economic conditions improve.

## Earnings

The earnings of setup workers compare favorably with those of other skilled machining workers. In 1980, setup workers in metropolitan areas had average earnings of over $9.78 an hour.

Many setup workers are members of unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; and the United Steelworkers of America.

## Related Occupations

The occupations most closely related to machine tool setup worker are, of course, the other machining occupations. These include all-round machinists, instrument makers, machine tool operators, and tool-and-die makers.

Other occupations that require precision and skill in working with metal include arc cutters, blacksmiths, gunsmiths, locksmiths, patternmakers (metal), and welders.

## Sources of Additional Information

See the list under this same heading in the statement on all-round machinists elsewhere in the *Handbook*.

# Printing Press Operators and Assistants

## Nature of the Work

Printing press operators prepare and operate the printing presses in a pressroom.

Before actually starting the press, press operators set up and adjust it to insure that the printing impressions are distinct and uniform. Press operators first insert and lock type setups or plates into the press bed and tighten the locking attachment with a wrench. The operators then level the pressplates by placing pieces of paper that are exactly the right thickness underneath low areas of the plates.

Press operators also adjust control margins and the flow of ink to the inking roller. In some shops, they oil and clean the presses and make minor repairs. Press operators who work with large presses have assistants and helpers.

Press operators' jobs may differ from one shop to another, mainly because of differences in the kinds and sizes of presses in the shop. Press operators in small commercial shops generally operate relatively simple manual presses. On the other hand, a crew of several press operators and press assistants runs giant presses used by the large newspaper, magazine, and book printers. These presses are fed paper in big rolls called "webs" up to 50 inches or more in width. They print the paper on both sides; cut, assemble, and fold the pages; and count the finished sections as they come off the press.

Many modern plants have installed printing presses that use computers and sophisticated instrumentation to control press operations. With this equipment, the press operator monitors a control panel that detects problems. To adjust the press, the operator pushes the proper button on the control panel. Press operators are generally designated according to the type of press they operate: Letterpress, gravure, or offset.

## Working Conditions

Operating a press is physically demanding. Press operators are on their feet most of the time and have to lift heavy plates.

Pressrooms are noisy, and workers in certain areas frequently wear ear protectors. Press operators are subject to hazards when working near machinery. Often, they work under pressure to meet deadlines.

Many press operators work evening and night shifts.

## Employment

About 178,000 press operators and assistants were employed in 1980. About half worked for commercial printing shops and book and magazine publishers. Many others had jobs in newspaper plants. Some press operators and assistants worked for banks, insurance companies, paper manufacturers, and organizations that do their own printing, such as Federal, State, and local governments.

Press operators and assistants can find jobs throughout the country, but employment is concentrated in large printing centers such as New York, Los Angeles, Chicago, Philadelphia, and Washington, D.C.

## Training, Other Qualifications, and Advancement

Most press operators learn their trade through apprenticeship, but some learn as helpers or press assistants. Others obtain their skills through a combination of work experience and vocational or technical school training.

The length of apprenticeship and the content of training depend largely on the kind of

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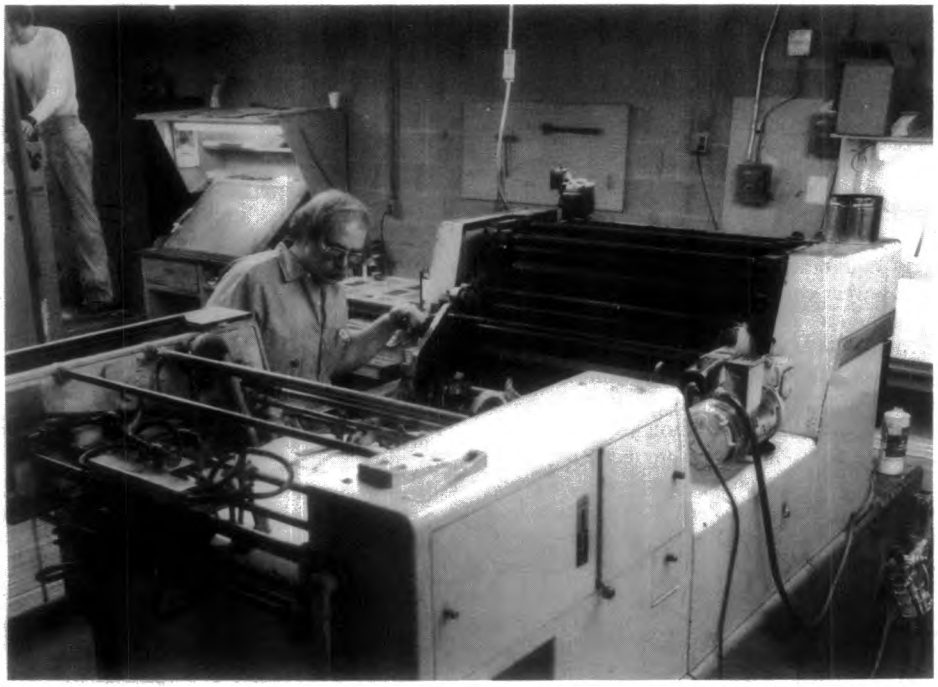

Many printing press operators learn their trade through apprenticeship programs.

press used in the plant. Most press operators are trained to operate more than one press, but specialize in a particular area of printing such as letterpress, lithography, or gravure. The apprenticeship period in commercial shops is 2 years for press assistants, and 4 years for press operators. In addition to on-the-job instruction, the apprenticeship includes related classroom or correspondence school courses. Courses in printing provide a good background. Because of technical developments in the printing industry, courses in chemistry, electronics, and physics also are helpful.

Mechanical aptitude is important in making press adjustments and repairs. An ability to visualize color is essential for work on color presses.

Technological changes have had a tremendous effect on the skill requirements of press operators. For example, printing companies which change from sheet-fed offset presses to web-offset presses have to retrain their entire press crew because the skill requirements for the two types of presses are very different. Web-offset presses, with their faster operating speeds, require faster decisions, monitoring of more variables, and greater physical effort.

Press operators may advance in pay and responsibility by taking a job working on a more complex printing press. For example, a two-color sheet-fed press operator may become a four-color sheet-fed press operator. Others may advance to press operator-in-charge and be responsible for the work of the entire press crew.

## Job Outlook

Employment of press operators is expected to increase more slowly than the average for all occupations through the 1980's. The increased use of faster and more efficient presses will partially offset the need for more press operators arising from growth in the amount of printed materials. In addition to the jobs resulting from growth in demand for these workers, openings will arise each year as press operators retire, die, or transfer to other occupations.

Printing press operators are expected to face competition for jobs. The number of applicants to apprenticeship programs is expected to exceed the number of openings. As a result, most people will have to take jobs as press assistants or unskilled laborers before being selected for an apprenticeship. Since many firms are switching to web-offset presses from letterpresses or sheet-fed presses, opportunities are expected to be more favorable for web-press operators.

Although most job opportunities will continue to be in the printing industry, a growing number of openings will be found in other industries, such as papermills, which are doing more of their own presswork instead of contracting it out to printing firms.

## Earnings

According to a 1980 survey of union wages, the estimated average minimum hourly rate for newspaper press operators-in-charge was $11.14; for newspaper press operators, $10.38; for book and job cylinder press operators, $10.87; and for book and job press assistants and feeders, $10.32. Press operators who worked night shifts received extra pay. In 1980, the average hourly rate for all nonsupervisory and production workers in private industry, except farming, was $6.66.

## Related Occupations

Other workers who set up and operate production machinery are papermaking machine operators, shoemaking machine operators, bindery machine operators, and precision machine operators.

## Sources of Additional Information

Details about apprenticeships and other training opportunities may be obtained from local employers such as newspapers and printing shops, the local office of the unions mentioned below, or the local office of the State employment service.

For general information about press operators and assistants, write to:

Graphic Arts International Union, 1900 L St. NW., Washington, D.C. 20036.

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

International Printing and Graphic Communications Union, 1730 Rhode Island Ave. NW., Washington, D.C. 20036.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22209.

# Production Painters

## Nature of the Work

Almost every metal or wood product manufactured gets a coating of paint or other finish before it leaves the factory. Automobiles, for example, usually receive rust preventative, primer, and paint totaling at least 10 coats. Even pencils are dipped in paint several times before they are packed into boxes.

The workers who apply the varnish, lacquer, paint, and other finishes used are called production painters. Because they generally work on assembly lines, production painters' skills are different from those of painters who repair damaged cars in body shops or from those who paint buildings. (Information on these painters can be found in separate statements elsewhere in the *Handbook*.) Most production painters use spray guns to apply finishes; the rest operate automatic painting machinery, such as spraying machines, dipping tanks, and tumbling barrels.

Painters mix the paint at the beginning of the painting process. They first figure areas to be covered in order to mix the right amount, and then follow directions to blend paint to its correct color and thickness. These steps require simple arithmetic involving decimals and fractions. Viscosity meters are used to make sure the paint is the right consistency for proper application. Pressure of the spray gun nozzles and spray pattern controls also must be adjusted properly to ensure that the paint is evenly applied.

Besides spraying paint, painters on the production line have other duties. If an object is to be multicolored, they apply masking

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tape to keep colors from overlapping. Production painters who operate machinery set up painting equipment at the beginning of the shift and are responsible for keeping it running. Painters also may operate washing tanks to clean items before painting and baking ovens to dry the paint. At the end of the shift, painters clean spray guns, viscosity meters, mixing paddles, and other equipment.

An increasing number of production lines use automatic painting machinery and robots controlled by workers who adjust the nozzles of guns used by robots. Here, production painters called "touchup" painters check for imperfections and spray-paint parts of an article that the machine misses or cannot reach, such as inside surfaces. As production lines become more automated, painters must learn to handle machinery such as electrostatic applicators and powder-type painting systems.

## Working Conditions

Production painters generally work a 40-hour week. However, work schedules may vary at plants with more than one shift. Usually in order of seniority, workers can accept or reject a certain job on a given shift.

Production painters usually have to stand for long periods of time to do their jobs. To paint the underside or top of an object, such as a car, may require reaching or crouching in uncomfortable positions. Production painters on assembly lines may be under pressure to keep up with the speed of the lines. Since painters may spray hundreds of identical items a day, the work tends to be more monotonous than in many other blue-collar jobs.

Because production painters are exposed to the hazards of fumes from paint and paint-mixing ingredients, they may wear masks which cover the nose and mouth. This is not very comfortable during a full day's work. Many wear coveralls to protect their clothes.

## Employment

About 108,000 production painters were employed in 1980. Almost two-thirds worked in plants that made automobiles, machinery, furniture and other wood products, or manufactured metal products such as cans, tinware, and handtools. Although production painters are scattered geographically, large numbers are employed in industrialized States.

## Training, Other Qualifications, and Advancement

Production painters acquire their skills on the job, usually by watching and helping experienced painters. Training varies from a few days to several months. Some modern painting processes, such as those used to apply powdered coatings, demand more skill than others and thus a longer training period. As painters gain experience, they can advance to higher skill categories, assume more responsibility, and receive higher wages.

Production painters need good eyesight and a discriminating sense of color in order to distinguish subtle color differences and to see that paint has been applied evenly.

High school graduation is generally not required for entry level positions, but the ability to read and write and do basic arithmetic is essential.

Most production painters use spray guns to apply finishes.

## Job Outlook

Employment of production painters is expected to increase about as fast as the average for all occupations through the 1980's. Many job openings also will result as experienced workers transfer to other occupations, retire, or die.

Most manufacturing industries are expected to increase their output in the years ahead. Demand for consumer products, such as automobiles and furniture, will increase as population and personal income grow. Business growth will create a need for more industrial machinery and equipment. Employment of painters is not expected to keep pace with this greater manufacturing output because increased use of automatic painting processes and other laborsaving innovations should raise output per worker. Nevertheless, there will still be a need for extensive touchup work which can not be automated.

Most production painters work in plants that produce durable goods, such as automobiles, machinery, and furniture. Since purchases of these goods often can be put off, employment in these plants is particularly sensitive to economic conditions. During recessions, production painters may be laid off.

## Earnings

Hourly wage rates for production painters ranged from $4.50 to $11 in 1980, based on information from a limited number of union contracts.

Unions to which production painters belong include the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; International Association of Machinists and Aerospace Workers; and the United Steelworkers of America.

## Related Occupations

Production painters apply paints using spray equipment. Other workers who use spray equipment are: Auto painters, construction painters, and ceramics and pottery makers.

## Sources of Additional Information

More facts about job opportunities in this field may be available from local offices of the State employment service. General information on production painters may be obtained from:

Research Department, United Automobile Workers, 8000 E. Jefferson Ave., Detroit, Mich. 48214.

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# Fabricators, Assemblers, and Handworking Occupations

The workers discussed in this section of the *Handbook* produce manufactured goods. Using handtools and hand-held power tools, they perform tasks ranging from the repetitive to the highly intricate.

Most entry level jobs require relatively little formal education; few employers insist on a high school diploma. What counts is the ability to perform. Workers acquire their skills on the job, usually in a matter of days or weeks. Formal training programs are available for the more technically demanding occupations such as welding, however.

This section of the *Handbook* describes the work of assemblers, automobile painters, and welders. Many other production occupations have similar entry requirements. Some of these are identified in the following tabulation, which presents 1980 employment estimates for selected fabricating, assembly, and handworking occupations:

| | |
|---|---|
| Welder and flamecutter | 573,000 |
| Electrical and electronic assembler | 233,000 |
| Automotive painter | 41,000 |
| Electronic wirer | 31,000 |
| Hand presser | 29,000 |
| Meat boner | 17,000 |
| Metal pourer | 15,000 |
| Automobile seat cover installer | 9,000 |
| Furniture assembler and installer | 9,000 |
| Hand decorator | 5,000 |

Many of the fabricating, assembly, and handworking occupations are sensitive to fluctuations in the business cycle. As factory orders decline during economic downturns, workers may experience shortened workweeks, layoffs, and plant closings. Workers employed in motor vehicle and other durable goods manufacturing or in industries that produce construction and building materials are especially affected by changes in business conditions. On the other hand, workers in industries such as electronic equipment and computer manufacturing are less likely to be affected.

Some production jobs are being eliminated by advanced technology. Robotics—the use of automated assembling, painting and welding equipment—is expected to reduce employment in some of the more repetitive and dirty jobs in the automobile industry, for example. More information about job opportunities and job security appears in the statements that follow.

## Assemblers

### Nature of the Work

When Henry Ford began producing automobiles on an assembly line, modern mass production was born. Workers who had been building each automobile independently, now found themselves specializing in just one part of the job. Production became a team effort, with each worker performing a single task on every car rolling by on the line. Over the years, mass production spread to other industries, until today almost every manufactured item is produced in this way.

Workers who put together the parts of manufactured articles are called assemblers. Sometimes hundreds of assemblers work on a single finished product.

Assemblers usually work on items that move past their work stations automatically on conveyors. In the automobile industry, for example, one assembler may put nuts on bolts by hand or with a handtool, and the next worker down the line may tighten the nuts with a power wrench. These workers must complete their job within the time it takes the part or product to pass their work station.

Other assemblers, known as bench assemblers, do more delicate work. Some bench assemblers make subassemblies. Subassemblies are the intermediate steps in the production process; for example, steering columns for automobiles or motors for vacuum cleaners. Other bench assenblers make entire products. Bench assemblers in rifle manufacturing plants, for example, build complete rifles from a collection of parts and subassemblies. They then test the finished product to be sure it functions correctly. Benchwork generally requires the ability to do precise and detailed work. Electronics assemblers use tweezers, tiny cutters, and magnifying lenses to put together the small components used in radios and calculators.

Another group of assemblers, called floor assemblers, put together large machinery or heavy equipment on shop floors. School buses, cranes, and tractors are put together in this way. Parts are installed and fastened, usually with bolts, screws, or rivets. Assemblers often use a power tool, such as a grinder or power drill, to get a proper fit.

Some experienced assemblers work with little or no supervision on the more complex parts of subassemblies and are responsible for the final assembly of complicated jobs. They may assemble a television set or put together and test a calculator. Some work with the engineers and technicians, assembling products that these people have just designed. To test new ideas and build models, these workers must know how to read blueprints and engineering specifications and how to use a variety of tools and precision measuring instruments.

### Working Conditions

The working conditions of assemblers differ, depending on the particular job performed. Bench assemblers work while seated at tables. Many of them work in rooms that are clean, well lighted, and free from dust. Floor assemblers of industrial machinery may come in contact with oil and grease, and their working areas may be quite noisy due to machinery or tools being used nearby. They may have to lift and fit heavy objects. Workers on assembly lines are under pressure to keep up with the speed of the lines. Since most assemblers only perform a few steps in the assembly process, assembly jobs tend to be monotonous.

Work schedules of assemblers may vary at plants with more than one shift. Workers can accept or reject a certain job on a given shift, usually in order of seniority.

### Employment

Virtually all of the 1,670,000 assemblers employed in 1980 worked in plants that manufactured durable goods. Thirty percent of these workers assembled electronic and electrical machinery, equipment, and supplies including electrical switches, welding equipment, electric motors, lighting equipment, household appliances, and radios and televisions. Nearly 17 percent of all assemblers put together nonelectrical machinery (diesel engines, steam turbine generators, farm tractors, mining and construction machinery, computers, and window air conditioners). Manufacturers of motor vehicles and associated equipment employed about 13 percent.

Assemblers are concentrated in the heavily industrialized States of California, New York, Michigan, Illinois, Ohio, and Pennsylvania.

### Training, Other Qualifications, and Advancement

Employers seek workers who can do routine work at a fast pace. A high school diploma is helpful but usually is not required.

For some types of assembly jobs, applicants may have to meet special requirements. Some employers look for applicants with mechanical aptitude and prefer those who have taken vocational school courses such as ma-

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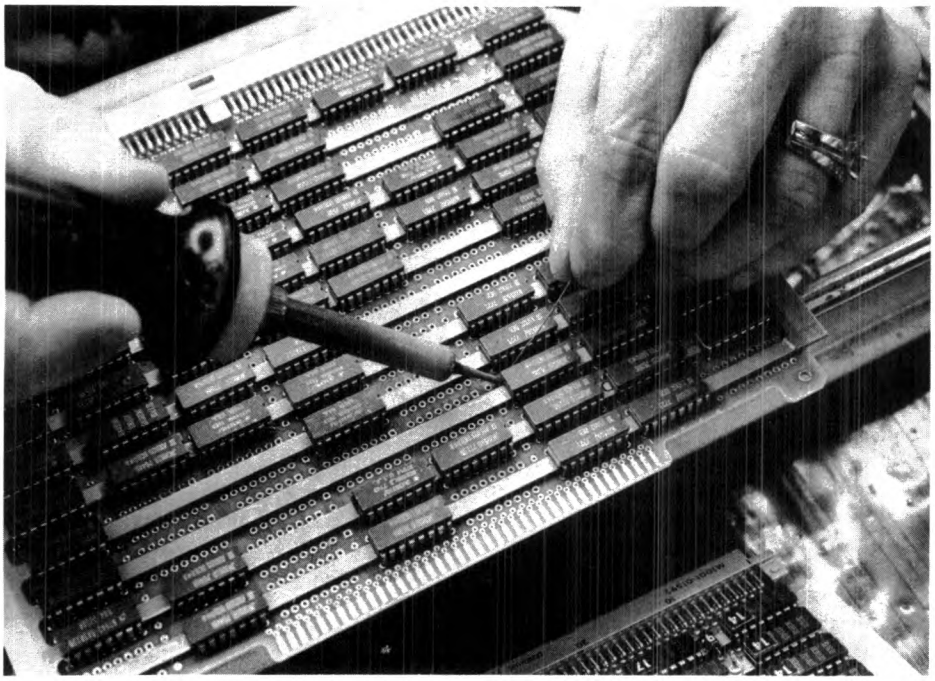

Assembling electronic components is detailed work that requires concentration.

ehine shop. Good eyesight, with or without glasses, may be required for assemblers who work with small parts. In plants that make electrical and electronic products, which may contain many different colored wires, applicants often are tested for color blindness.

Inexperienced people can be trained to do most kinds of assembly work in a few days or weeks. New workers may have their job duties explained to them by the supervisor and then be placed under the direction of experienced employees. When new workers have developed sufficient speed and skill, they are placed on their own and are responsible for the work they do.

As assemblers become more experienced, they may progress to assembly jobs that require more skill and be given more responsibility. Experienced assemblers who have learned many assembly operations and thus understand the construction of a product may become product repairers. These workers fix assembled articles that inspectors have identified as defective. Assemblers also may advance to inspector, or be promoted to supervisor. In some firms, assemblers can become trainees for one of the skilled trades.

## Job Outlook

Employment of assemblers is expected to grow as fast as the average for all occupations through the 1980's, as manufacturing plants respond to the increasing demand for consumer products and for industrial machinery and equipment. In addition, many job openings will occur because of the need to replace workers who leave the occupation, retire, or die. Replacement needs will in fact be the major source of job openings.

New automated robot assembly machines will replace some workers, but most assembly jobs will not be affected until the robot technology is greatly improved. Changes in business conditions and national defense needs will have a more pronounced effect on assembly jobs, since most are in plants that produce durable goods, such as automobiles and aircraft. Layoffs will occur during downturns in the economy.

## Earnings

Wage rates for assemblers ranged from about $4 to $9 an hour in 1980, according to information from a limited number of union contracts. Most assemblers covered by these contracts made between $6 and $7 an hour. Some assemblers are paid incentive or piecework rates, and therefore can earn more by working faster.

Many assemblers are members of labor unions. These unions include the International Association of Machinists and Aerospace Workers; the International Union of Electrical, Radio and Machine Workers; the United Automobile, Aerospace and Agricultural Implement Workers of America; the International Brotherhood of Electrical Workers; and the United Steelworkers.

## Related Occupations

Other occupations which involve handling or assembling things are sewers and stitchers, weavers, welders, packers and wrappers, ophthalmic laboratory technicians, checkers, postal clerks and sorting clerks, and operators of drill presses, laminating machines, grinders, and riveting machines.

## Source of Additional Information

Information about employment opportunities for assemblers is available from local offices of the State employment service.

# Automotive Painters

(D.O.T. 845.381-010 and -014)

## Nature of the Work

Automotive painters make old and damaged motor vehicles "look like new." These skilled workers repaint older automobiles, trucks, and buses that have lost the luster of their original paint and make fender and body repairs almost invisible. (Painters who work on the production lines at motor vehicle manufacturing plants are discussed elsewhere in the *Handbook*.)

When painting only the repaired portions of a vehicle, painters often have to mix paint to match the original color, which can be very difficult if the color has faded. To prepare a vehicle for painting, painters or their helpers use power sanders and sandpaper to remove the original paint or rust, and fill small nicks and scratches with body putty. They also remove or mask parts they do not want painted, such as chrome trim, headlights, windows, and mirrors.

Painters use a spray gun to apply several primer coats. They apply lacquer to vehicles with metal bodies and acrylic enamel to newer vehicles with plastic body parts. They adjust the spray gun nozzle according to the kind of paint being used and, if necessary, they adjust the air-pressure regulator to obtain the correct pressure. If the spray gun is not adjusted properly, paint may run or go on too thinly. To speed drying, they may place the freshly painted vehicle under heat lamps or in a special infrared oven. After each coat of primer dries, they sand the surface to remove any irregularities and to help the next coat adhere better. Final sanding of lacquer primers may be done by hand with a fine grade sandpaper; acrylic enamel primers do not require final sanding. After the final coat of paint has dried, painters or their helpers usually polish the newly painted surface.

## Working Conditions

Automotive painters work indoors where they may be exposed to dangerous fumes from paint and paint-mixing ingredients. In most shops, however, painting is done in special ventilated booths that protect the painters from these hazards. Painters also wear masks or respirators for additional protection. Painters must bend and stoop to reach all parts of the vehicle.

## Employment

About 41,000 persons worked as automotive painters in 1980. Almost three-fourths worked in shops that specialize in automotive repairs. Most others worked in the repair shops of automobile and truck dealers. Some painters worked for organizations that maintained and repaired their own fleets of motor vehicles, such as trucking companies and buslines.

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Painters are employed throughout the country, but are concentrated in metropolitan areas.

## Training, Other Qualifications, and Advancement

Most automotive painters start as helpers and gain their skills informally by working with experienced painters. Beginning helpers usually remove trim, clean and sand surfaces to be painted, mask surfaces that they do not want painted, and polish finished work. As helpers gain experience, they progress to more complicated tasks, such as mixing paint to achieve a good match and using spray guns to apply primer coats or final coats to small areas. Becoming skilled in all aspects of automotive painting usually requires 3 to 4 years of on-the-job training.

A few automotive painters learn through apprenticeship. Apprenticeship programs, which generally last 3 years, consist of on-the-job training supplemented by formal instruction in areas such as shop safety practices, proper use of equipment, and blending colors.

Painters should have good health, keen eyesight, and a good color sense. Courses in automobile-body repair, offered by high schools and vocational schools, are helpful. Completion of high school generally is not required but usually is an advantage.

Voluntary certification by the National Institute for Automotive Service Excellence is recognized as a standard of achievement for automotive painters. For certification, painters must pass a written examination and have at least 2 years of experience in the field. High school, trade or vocational school, or community or junior college training in automotive painting and refinishing may substitute for up to 1 year of experience. Certified painters must retake the examination at least every 5 years.

An experienced automotive painter with supervisory ability may advance to shop supervisor. Many experienced painters with the necessary funds open their own shops.

## Job Outlook

Employment of automotive painters is expected to increase faster than the average for all occupations through the 1980's, as the number of motor vehicles damaged in traffic accidents grows.

In addition to jobs created by growth in demand for these workers, many openings are expected to arise each year as experienced painters transfer to other occupations, retire, or die. Job opportunities will be best in heavily populated areas.

Damage from accidents is expected to grow, despite better highways, driver training courses, and improved bumpers and other safety features on new vehicles which may slow the rate of growth. Painters also will be needed to repaint older vehicles which have rust or faded paint.

Experienced automotive painters can expect relatively steady work because the automotive painting business is not affected much by changes in economic conditions. Regardless of the state of the economy, automobiles continue to be damaged in accidents and require repair and refinishing. However, there may be fewer openings for persons seeking to enter this occupation during recessions.

Automobile painters wear masks to protect themselves from fumes.

## Earnings

Experienced painters employed by automobile dealers in 23 large cities had estimated average hourly earnings of $12.75 in mid-1980, nearly twice the average for all nonsupervisory workers in private industry, except farming. Beginning apprentices usually start at about half the hourly rate of fully qualified painters. As they progress, their wages gradually approach those of experienced automotive painters. Helpers started at lower wage rates.

Many painters employed by automobile dealers and independent repair shops receive a commission based on the labor cost charged to the customer. Under this method, earnings depend largely on the amount of work a painter does and how fast it is completed. Employers frequently guarantee commissioned painters a minimum weekly salary. Helpers and apprentices usually receive an hourly rate until they become sufficiently skilled to work on a commission basis. Trucking companies, buslines, and other organizations that repair their own vehicles usually pay by the hour. Most painters work 40 to 45 hours a week.

Many automobile painters belong to unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.). Most union painters work for the larger automobile dealers, trucking companies, and buslines.

## Related Occupations

Restoring damaged motor vehicles often involves repair of their bodies and mechanical components as well as painting. Automobile painters often work closely with the following related automotive service occupations: Automobile repair service estimators, automobile body repairers and customizers, automobile mechanics, and truck and bus mechanics.

## Sources of Additional Information

For more details about work opportunities, contact local automotive-body repair shops and automobile dealers; locals of the unions previously mentioned; or the local office of the State employment service. The State employment service also may be a source of

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information about apprenticeship and other training programs.

For general information about the work of automotive painters, write:

Automotive Service Industry Association, 444 North Michigan Ave., Chicago, Ill. 60611.

Automotive Service Councils, Inc., 188 Industrial Dr., Suite 112, Elmhurst, Ill. 60126.

National Automobile Dealers Association, 8400 Westpark Dr., McLean, Va. 22102.

Information on how to become a certified automotive painter is available from:

National Institute for Automotive Service Excellence, 1825 K St. NW., Washington, D.C. 20006.

# Welders and Flamecutters

(D.O.T. 81 exc. 819.281-018 and .687-010)

## Nature of the Work

Welding is the most common way of permanently joining metal parts. Typically, heat is applied to the metal pieces to be joined, the parts melt, fuse, and then form a permanent bond. Because of its strength, welding is used to construct and repair parts of ships, automobiles, spacecraft, and thousands of other products. Welding is also used to join beams and steel reinforcing rods in buildings, bridges, and highways.

There are three common ways to create the heat that is applied to the parts being joined. In electric arc welding, the most frequently used process, heat is created as electric current flows through an arc between the tip of the welding electrode and the metal. In resistance welding, heat is created in the weld metal by resistance to the flow of current through the metal. In gas welding, the flame from the combustion of burning gases melts the metal. In arc and gas welding, filler materials, called welding electrodes or welding rods, are melted and added to the weld puddle to fill the joint, giving it greater strength. It is the welder's job to control the amount of heat and the size of the melted area and to add the proper amount of filler material to form a strong joint.

Since welding processes differ and are used for many purposes, the equipment and skill levels of welders vary. Some jobs require highly skilled manual welders who know how to safely use gas and electric arc welding equipment in all positions and are able to plan their work from drawings or specifications. Skilled welders know the characteristics and properties, such as melting points, of steel, aluminum, and other commonly used metals. Examples of skilled welders are maintenance welders, pipe welders, and welders who construct ships and bridges.

In ship construction, welders join the steel plates, beams, and pipes. Some joints to be welded are on the floor (deck), some are on the walls, and some are overhead. Each must be carefully welded to insure that the ship will not break apart in rough seas.

Ship welders generally use manual arc welding equipment, although semiautomatic equipment is becoming more widely used. After welders read instructions to learn which materials and welding method to use, they obtain supplies from the storage area. To form a joint by arc welding, they use an electrode in a holder attached to an electrical cable coming from a welding power supply. Another cable is attached to the metal being welded. Thus, electricity will flow through the welding electrode, through the arc to the metal being welded, and back to the power supply. The power supply can be adjusted to provide the correct amount of current. When the power is turned on, welders "strike an arc" by briefly touching the electrode to the metal to start the electricity flowing and then pulling the rod back to form a small arc gap through which the current must flow. If the distance between the electrode and the metal is correct, a stable electric arc will bridge the space; the heat from the arc melts the electrode and the metal. Welders move the arc along the length of the joint. As the electrode melts and becomes shorter, they move the holder closer to the metal to keep the right distance from the arc. They replace very short length electrodes with new ones.

Maintenance welders repair tools, machines, and equipment. Often they bring portable gas torches, hoses, and tanks to the job because electricity may not be available.

When working on a broken pipe, for example, maintenance welders examine the pipe and prepare the break for repair. They then select a welding filler rod appropriate for the job. Next, they light the torch and adjust regulators on the cylinders of fuel gas, such as acetylene, and oxygen to obtain the right gas mixtures and flame. Then they heat the edges of the break with the torch. As the metal begins to soften, welders melt the end of the filler rod in the hot liquid metal as they carefully move the torch and rod along the break. Welders must keep the torch the correct distance from the metal, apply heat correctly, and repair the break with filler material.

Not all welders need the skills required of shipbuilding or maintenance welders. For example, to weld automobile frames, less skilled workers use equipment that automatically supplies the proper amount of arc heat and filler material to the joint. Assembly lines bring car frames to welders who then position their welding guns near the parts to be welded and operate a switch on the handle which automatically starts the arc. They guide the arc to complete the required joints before the assembly line takes the frame to another worker. Like other welders, they are responsible for the quality of the joint. However, the job usually requires less manipulative skill because all parts are identical and each is welded in the same position.

In factories where many identical parts need to be welded, automatic arc, electron beam, or resistance welding machines are used. Workers who operate such machines to weld automobile mufflers and washing machines, for example, need little knowledge of welding. These workers, frequently called welding machine operators to distinguish them from more skilled, manual welders, place the parts to be joined in fixtures on the machine and push a button. The machine then clamps the part in place and positions it, as necessary, to complete the welding cycle.

Ship welders join steel plates, beams, and pipes carefully to ensure that the ship will withstand rough seas.

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After the cycle is finished, operators remove the welded parts and load the machine again.

The work of arc and flame cutters is closely related to that of welders. Using heat from burning gases or an electric arc, cutters cut and trim metal rather than join it. Some electrically and mechanically operated machines follow guidelines automatically.

## Working Conditions

Welders frequently are exposed to potential hazards. They use protective clothing, safety shoes, goggles, helmets with protective lenses, and other devices to prevent burns and eye injuries. Although lighting and ventilation usually are adequate, some metals give off toxic gases and fumes as they melt. Workers often are in contact with rust, grease, and dirt on metal surfaces. Machine operators, however, are largely free from hazards associated with manual welding. A face shield or goggles generally are adequate protection. Skilled welders, working in welding booths, often have long periods of isolation from other workers.

## Employment

In 1980, about 573,000 welders and flamecutters were employed, including a relatively small number of cutters who used both flame and arc cutting equipment. Three out of four welders help manufacture durable goods; for example, boilers, bulldozers, trucks, ships, and consumer appliances such as refrigerators. Most of the rest repair metal products or help construct bridges, large buildings, and pipelines.

Welders are concentrated in manufacturing centers such as the Great Lakes States—Pennsylvania, Ohio, Michigan, Indiana, and Illinois. The rest are distributed much the same as the population, with large numbers in New York, Texas, Wisconsin, and California.

## Training, Other Qualifications, and Advancement

Although it takes several years of on-the-job training to become a skilled welder, less skilled work can be learned in just a few months or less. Some welding operators, for example, are taught to operate a machine in a few hours and can handle all aspects of the job within a week.

Entry level welding skills are taught in high schools, vocational-technical institutes, and community colleges throughout the country. Private vocational schools also teach welding in courses that take from 6 months to 1 year to complete. The Armed Forces operate welding schools as well. Many welders learn their craft through informal, on-the-job instruction while they work as welders' helpers. A few companies operate welding schools, although these programs usually teach advanced techniques to qualify welders for work on critical applications such as nuclear reactors or high pressure boilers.

All these programs train manual welders. Welders who operate automatic welding machines need very little training and can usually be fully trained on the job in a matter of hours or days. In many manufacturing plants, employers select capable assemblers or other workers to fill job openings for welding machine operators.

Persons considering work as welders or cutters need manual dexterity, good eyesight, and good eye-hand coordination. They should have the ability to concentrate on detailed work for long periods and be physically able to bend, stoop, and work in awkward positions. Most employers prefer applicants who have high school or vocational school training in welding. Courses in shop mathematics, mechanical drawing, blueprint reading, physics, and chemistry also are helpful.

New technological developments, especially in the nuclear energy and aerospace fields, require new skills. Because of the hazards of nuclear power plant operation and of air and space travel, both industries demand very high standards of reliability for welds. Before being assigned to work on buildings, bridges, pipelines, or other jobs where the strength of the weld is highly critical, welders may be required to pass an examination of their welding skills given by an employer or government agency. Welders who pass such examinations generally are referred to as "certified welders."

Promotion opportunities for welders are good. Some welding machine operators learn skilled welding jobs; skilled welders may be promoted to welding inspectors, technicians, or supervisors. Experienced workers who have obtained college training are in great demand as welding engineers to develop new applications for welding. A small number of experienced welders open their own repair shops.

## Job Outlook

Employment of welders is expected to increase as fast if not faster than the average for all occupations through the 1980's. Increases in population and income are expected to stimulate demand for buildings, heavy machinery, appliances, and thousands of other products that welders help make. The rate of expansion in the industries that produce those goods will determine the actual increase in the number of welders. In addition, many jobs will arise each year as welders transfer to other occupations, retire, or die. In economic downturns, welders are subject to layoff as demand for construction and durable goods declines.

Job opportunities in the 1980's will not be the same for all kinds of welders. Robot welding systems will replace many welding machine operators on production lines. Highly skilled welders will not be affected by automation, however, and could in fact experience greatly increased demand if nuclear power production regains favor and synthetic fuel production becomes economical. Job prospects for welders will also vary markedly by geographic region; demand will be strong in the Sunbelt and Western States in particular.

## Earnings

The limited wage data available indicate that welding machine operators earned from $9 to $10 an hour in 1980. Welders in the construction industry earned $12 to $13 an hour, depending on location.

Welders belong to many different unions. Among these are the International Association of Machinists and Aerospace Workers; the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada; and the United Electrical, Radio and Machine Workers of America.

## Related Occupations

Welders are highly skilled workers who must be very familiar with the properties of metal and who use hand-held equipment or machines to do factory or construction work. Other people with similar duties are blacksmiths, forge shop workers, all-round machinists, machine tool operators, tool-and-die makers, millwrights, sheet-metal workers, and boilermakers.

## Sources of Additional Information

A list of postsecondary programs in welding and cutting, arranged by State, may be found in *Programs and Schools, a Supplement to the Directory of Postsecondary Schools with Occupational Programs, 1978*, a publication of the U.S. Department of Education's National Center for Education Statistics. This publication may be available in counseling centers and large public libraries.

For further information on training and work opportunities for welders, contact local employers or the local office of the State employment service. For general information about welders, write to:

The American Welding Society, 2501 NW. 7th St., Miami, Fla. 33125.

International Union, United Automobile, Aerospace and Agricultural Implement Workers of America, 8000 East Jefferson Ave., Detroit, Mich. 48214.

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# Transportation and Material Moving Occupations

People in transportation and material moving occupations operate trucks, buses, taxicabs, trains, ships, aircraft, and industrial equipment that moves people and materials. Although they are employed in all industries, workers in these occupations are concentrated in the transportation industry. The following tabulation presents 1980 employment estimates for the largest occupations in this group:

**Transportation and material moving occupations**

| | |
|---|---|
| Truckdriver and delivery and route worker | 2,522,000 |
| Heavy equipment operator | 453,000 |
| Industrial truck operator | 400,000 |
| Busdriver | 285,000 |
| Crane, derrick, and hoist operator | 121,000 |
| Airplane pilot | 82,000 |
| Railroad brake operator | 74,000 |
| Taxicab driver | 71,000 |
| Conveyor operator | 53,000 |
| Locomotive engineer | 47,000 |
| Chauffeur | 42,000 |
| Parking attendant | 36,000 |
| Railroad conductor | 33,000 |

Most employers prefer to hire high school graduates for transportation and material moving job, but persons who have not completed high school are often hired if they meet all other qualifications. For some occupations, vocational or technical training or some college education is an advantage. The ability to understand and follow complex operating rules, procedures, and instructions is an important requirement for most of these jobs. Bus drivers, for example, must adhere to detailed schedules, routes, and operating procedures, and airplane pilots must painstakingly follow complex checkout instructions before takeoff to insure that their craft is in proper operating condition. During operation, they follow procedures to insure the safety of lives and property.

Although most of this work is not strenuous, much is tedious or stressful. Coordination and manual dexterity are vital. Some mechanical aptitude is needed to recognize when a vehicle, bulldozer, or power truck is not operating properly. For many workers in these occupations, such as taxicab drivers, the efficiency with which they perform their work directly affects their earnings.

Good vision, usually with or without glasses, and ability to judge distances are required for transportation and material moving occupations. Good color perception is also required for many of these jobs. Regular physical examinations are required for most jobs to verify that individuals have not developed chronic medical conditions that might lead to an accident. Good health is vital in order to handle stress for prolonged periods of time, whether driving a taxicab through city traffic all day, or operating a crane at a high-rise construction site where a misjudgment of distance could dislodge fellow workers from their precarious perches.

Many transportation and material moving occupations are closely regulated. Most motor vehicle operators need a chauffeur's license and frequently must adhere to extensive regulations. Special operating certificates are also needed to be employed as an airplane pilot or a merchant marine officer.

More detailed information on training appears in the statements that follow.

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# Motor Vehicle Operators

Truck, bus, and taxicab drivers operate motor vehicles that transport passengers and goods over highways and city streets. Some drivers are behind the wheel almost all their working time, others also load and unload goods, make pickups and deliveries, and collect money. Route drivers sell as well as drive. Courteously dealing with people is an important part of the work of busdrivers, route drivers, and taxicab drivers. It is much less a factor for truckdrivers who usually work alone or with a helper.

Because motor vehicle operators spend so much time traveling streets and highways, they face a greater risk of accident than most other workers. Motor vehicle accidents are the leading cause of job-related serious injuries and deaths in this country.

The job outlook for motor vehicles operators varies. Employment of long-distance and local truckdrivers is expected to increase through the 1980's as more freight is moved by truck. Employment of busdrivers also is expected to increase as cities expand their transit systems and intercity bus travel increases. Employment in other motor vehicle operative occupations is expected to grow more slowly than the average for all occupations. In addition to openings resulting from growth, many new motor vehicle operators will be hired to replace those who transfer to other occupations, retire, or die.

Motor vehicle operator jobs offer excellent opportunities for persons who are not planning to attend college. The pay for most drivers is relatively high, and working conditions are fairly good. Many drivers are free from close supervision. The sections that follow cover long-distance and local truckdrivers, and intercity and local transit busdrivers.

## Intercity Busdrivers

(D.O.T. 913.463-010)

### Nature of the Work

For many towns and smaller cities, buses provide the only public means of travel to and from other communities. And for large cities, buses are an alternative to rail or air transportation. Over short distances, taking a bus may be just as fast as taking a train or plane, and service may be more frequent.

When busdrivers report to the terminal or garage, they are assigned buses and pick up tickets, report blanks, and other items needed for their trips. They inspect their buses carefully to make sure the brakes, steering mechanism, windshield wipers, lights, and mirrors work properly. They also check the fuel, oil, water, and tires, and make certain that the buses are carrying safety equipment, such as fire extinguishers, first aid kits, and emergency reflectors.

Drivers move the buses to loading platforms where they take on passengers. They collect fares—tickets usually—as passengers board the buses and may use the buses' public address systems to announce the destination, route, time of arrival, and other information concerning the trips. At small stations, busdrivers may load and unload luggage, but at terminals and larger stations, this chore usually is performed by baggage handlers.

Drivers' routes vary. On local runs, drivers stop at many small towns only a few miles apart. On express runs, however, they may stop only at major cities after driving several hours on interstate highways. Drivers must always be alert to prevent accidents, especially in fast-moving highway traffic. They must operate the bus at safe speeds while trying to keep schedules and often must cope with adverse road and weather conditions.

Before arriving at major terminals, they announce the stop and the scheduled departure time. At some small stations, drivers stop only if passengers are waiting to board or leave the bus or if they have freight to pick up or deliver. Drivers also regulate lighting, heating, and air-conditioning equipment for the passengers' comfort. If repair service is not available, they may change flat tires.

As required by the U.S. Department of Transportation, drivers keep a current record on each trip of the distance traveled and the periods of time they spend driving, performing other duties, and off duty. Upon arriving at their final destinations, drivers complete and turn in these and other reports for their employers. They also report any repairs the buses need. Drivers working for small bus companies may also load and unload baggage and freight, fuel buses, and perform light maintenance.

Drivers who operate chartered buses pick up a group of people, take them to the group's destination, and generally remain with them until they return. These trips frequently require drivers to remain away from home one night or more.

### Working Conditions

Since intercity buses operate at all hours every day of the year, drivers may work nights and weekends. New drivers may be on call at all hours and may be required to report for work on very short notice. Drivers on some long routes remain away from home overnight. Driving schedules may range from 6 to 10 hours a day and from 3-1/2 to 6 days a week. However, U.S. Department of Transportation regulations specify that intercity drivers shall not drive more than 10 hours without having at least 8 consecutive hours off and shall not drive after being on duty for 15 hours without at least 8 hours off duty.

Driving an intercity bus usually is not physically difficult, but it is tiring and requires steady nerves. The busdriver is given a great deal of independence on the job and is solely responsible for the safety of the passengers and bus. Many drivers like working without direct supervision and take pride in assuming these responsibilities. Some also enjoy the opportunity to travel and to meet the public.

### Employment

Nearly 30,000 intercity busdrivers were employed by about 1,330 bus companies in 1980. Some work out of terminals located in some of the small communities served by buses, but most work out of major terminals in large cities. Drivers of charter and tour buses often work out of company garages.

### Training, Other Qualifications, and Advancement

Intercity busdrivers must meet qualifications established by the U.S. Department of Transportation or a State agency, if the driver works only within one State. Drivers must be at least 21 years old and be able to read, write, and speak English well enough to communicate with passengers and to complete reports. They also must have good hearing, at least 20/40 vision with or without glasses, and normal use of their arms and legs. In addition, they must pass comprehensive written examinations which test their knowledge of Department of Transportation and State motor vehicle regulations, as well as a driving test in the type of bus they will operate. Most States require that drivers have a chauffeur's license, which is a commercial driving permit.

Many intercity bus companies have considerably higher requirements. Most prefer applicants who are at least 25 years of age; some prefer applicants who have bus or truckdriving experience. One large company requires applicants to have 20/20 vision with or without glasses.

Since they represent their companies in dealing with passengers, busdrivers must be courteous and tactful. An even temperament and emotional stability are important qualifications, because driving buses in heavy, fast-moving traffic and dealing with passengers can be a strain.

Many intercity bus companies give driver trainees 2 to 8 weeks of classroom and "be-



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hind-the-wheel'' driving instruction. In the classroom, trainees learn company and U.S. Department of Transportation rules, State and municipal driving regulations, and safe driving practices. They also learn how to determine ticket prices, keep records, and deal courteously with passengers.

Trainees for many companies learn and practice driving skills on set courses. They make turns and zig-zag maneuvers, back up, and drive in narrow lanes. As they gain experience, they drive on lightly traveled roads, eventually advancing to heavily trafficked highways and city streets. They also make trial runs, without passengers, to improve their driving skills. After completing final driving and written examinations, new drivers begin a ''break in'' period. During this period, they make regularly scheduled trips with passengers, often accompanied by an experienced driver. The experienced driver gives helpful tips, answers questions, and determines that the new driver is performing satisfactorily.

New drivers start out on the ''extra board,'' which is a list of drivers who are given temporary assignments. While on this list, they may substitute for regular drivers who are ill or on vacation, or they may drive chartered buses. Extra drivers may have to wait several years before they have enough seniority to get a regular assignment.

Opportunities for promotion generally are limited, particularly in small companies. For most drivers, advancement consists of receiving higher paying or more leisurely routes. Experienced drivers may be promoted to jobs as dispatchers, supervisors, or terminal managers.

## Job Outlook

Employment of intercity busdrivers is expected to grow more slowly than the average for all occupations through the 1980's. Intercity passenger travel will grow as population and income increase, but bus travel is expected to grow more slowly. Higher incomes will enable more people to travel by plane, which provides faster service over long distances, although it is more expensive. However, continuing public concern about energy conservation should increase intercity bus travel and busdriver employment. Additional intercity busdrivers will be needed to replace experienced drivers who transfer to other occupations, retire, or die. Since this relatively high-paying occupation attracts many qualified persons, applicants can expect stiff competition for the openings that arise. Applicants in excellent physical condition with good driving records stand the best chance of being hired.

Because buses are a relatively inexpensive mode of intercity travel, their ridership often increases during downturns in the economy as travelers switch to cheaper types of transportation. As a result, intercity busdrivers are seldom laid off.

## Earnings

Drivers employed by large intercity bus companies had estimated average annual earnings of about $22,000 in 1980, about 75 percent above the average for all nonsupervisory workers in private industry, except farming. The wages of intercity busdrivers typically are computed on a mileage basis, but short runs may be on an hourly rate. Most regular drivers are guaranteed a minimum number of miles or hours per pay period. For work on other than regular assignments, regular drivers receive additional pay.

Most intercity busdrivers belong to the Amalgamated Transit Union. In some areas of the country they belong to the United Transportation Union or the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.).

Experienced drivers often accompany trainees on trips.

## Related Occupations

Other occupations which involve driving heavy vehicles are hostlers, local transit busdrivers, local truckdrivers, long-distance truckdrivers, and operating engineers.

## Sources of Additional Information

For further information on job opportunities in this field, contact intercity bus companies or the local office of the State employment service.

# Local Transit Busdrivers

(D.O.T. 913.463-010)

## Nature of the Work

Everyday local transit busdrivers provide transportation for millions of Americans. These drivers follow definite time schedules and routes over city and suburban streets to provide passengers with an alternative to automobile driving and even ownership.

The workday for local busdrivers begins when they report to their assigned terminal or garage. (Large cities have several garages while a small city may have only one.) At the garage, drivers are given transfers and refund forms. Drivers who are picking up buses may check their vehicle's tires, brakes, windshield wipers, lights, and oil and water. They then drive to the start of their runs. Others go to designated intersections and relieve drivers who are going off duty.

On most runs, drivers pick up and discharge passengers at bus stops. As passengers board the bus, drivers make sure the correct cash fare, token, or ticket is placed in the fare box or that a valid pass is presented. They also collect or issue transfers. Drivers often answer questions about schedules, routes, and transfer points and sometimes call out street names at each stop.

Busdrivers' days are run by the clock, as they must pay special attention to their complicated schedules. Although drivers may run late in heavier than average traffic, they do not let light traffic put them ahead of schedule so that they miss passengers.

Busdrivers must be alert to the traffic around them. Since sudden stops or swerves jar standing passengers, drivers try to anticipate traffic developments, not react to them.

At the end of each day, busdrivers turn in trip sheets with a record of fares received, trips made, and significant delays in schedule. They also turn in a report on the mechanical condition of their bus. In case of an accident, drivers must make out a report de-

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scribing exactly what happened before and after the event and obtain the names, addresses, and phone numbers of persons on the bus.

At times, drivers operate chartered buses—buses arranged for in advance by an organization or group. In these cases, they pick up a group of people, take them to their destination, and remain with them until they return.

## Working Conditions

Driving a bus through heavy traffic while dealing with passengers is not physically strenuous, but it may cause nervous strain and fatigue.

The workweek for regular drivers usually consists of 5 days with Saturdays and Sundays counted as regular workdays. Some drivers work evenings and after midnight. To accommodate the demands of commuter travel, many local busdrivers work "split shifts." For example, a driver may work from 6 a.m. to 10 a.m., and then return to work from 3 p.m. to 7 p.m. Drivers may receive extra pay for working split shifts.

## Employment

Nearly 97,000 local busdrivers were employed in 1980, primarily in large cities. Most worked for publicly owned transit systems or privately owned transit lines; a small number worked for sightseeing companies.

## Training, Other Qualifications, and Advancement

Applicants for busdriver positions should be at least 21 years old, be in good health, have good eyesight, with or without glasses, and have a good driving record. Many employers prefer applicants who have a high school education or its equivalent. Most require applicants to pass a physical examination and a written test of ability to follow complex bus schedules. Most States require busdrivers to have a chauffeur's license, which is a commercial driving permit. A relaxed personality is important since drivers face many minor annoyances such as traffic congestion, bad weather, and angry passengers.

Most local transit systems give driver trainees several weeks of classroom and "behind-the-wheel" instruction. In the classroom, trainees learn work rules, safety regulations, and safe driving practices. They also learn to read schedules, keep records, and deal tactfully and courteously with passengers. Trainees usually begin with several hours of instruction on a training course, then practice on city streets. Because a busdriver is seated higher than other drivers, defensive driving—seeing and avoiding possible traffic dangers ahead of time—has much potential and is stressed. Trainees memorize and drive each of the runs operating out of their assigned garage. They also take several trips with passengers while supervised by an experienced driver. Trainees may also have to pass a written examination and a driving examination.

A cheerful manner makes it easier to deal with bus riders.

Most experienced drivers have regularly scheduled runs. New drivers, however, usually are placed on an "extra" list to substitute for regular drivers who are ill or on vacation. They also are assigned extra and special runs, for example, those during morning and evening rush hours and to the stadium the day of a sports event. Charter runs also are driven by extra list drivers. And in cities that use transit buses to transport children to school, extra list drivers are the operators of these buses. New drivers remain on the extra list until they have enough seniority to get a regular run. This may take several years.

Runs are assigned on the basis of length of service, or seniority. Therefore, as drivers acquire seniority, they can choose runs they prefer, such as those that lead to overtime, or that have little traffic.

Opportunities for promotions generally are limited. However experienced drivers may advance to jobs as supervisors or dispatchers. These workers assign buses to drivers, check whether drivers are on schedule, reroute buses to avoid a blocked street or other problems, and dispatch extra vehicles and service crews to scenes of accidents and breakdowns. A few drivers advance to management positions. Promotion in publicly owned bus systems is often by competitive civil service examination.

## Job Outlook

Employment of local busdrivers is expected to increase about as fast as the average for all occupations through the 1980's. Increased use of automobiles in cities and population shifts to the suburbs—where most people drive

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their own cars—have caused a decline in bus ridership and driver employment. However, as part of the effort to conserve energy and reduce air pollution and traffic congestion, many cities are trying to improve local bus service by having express bus lanes, more frequent service with more routes, and more comfortable buses. Improved bus service will require more drivers. Additional drivers will be needed to replace drivers who transfer to other occupations, retire, or die.

Local transit busdrivers are rarely laid off during recessions. Even if bus ridership decreases, busdriver employment usually does not because scheduled service still must be provided.

## Earnings

According to a survey of union contracts in 62 large cities, local busdrivers averaged $9.02 an hour in 1980, about one-third more than the average for all nonsupervisory workers in private industry, except farming. Hourly wages were highest in the large cities.

Most local busdrivers are members of the Amalgamated Transit Union. Drivers in New York City and several other large cities belong to the Transport Workers Union of America. Some drivers belong to the United Transportation Union and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America.

## Related Occupations

Other driving occupations in local transit include streetcar operators and subway operators. Other workers who drive heavy vehicles on highways and city streets are intercity busdrivers, local truckdrivers, and long-distance truckdrivers.

## Sources of Additional Information

For further information on employment opportunities, contact a local transit system or the local office of the State employment service.

# Local Truckdrivers

(D.O.T. 900.683-010, 902.683-010, 903.683-010 through -018, 905.663-010 through .683-010, 906.683-010 through -022)

## Nature of the Work

In many instances, local truckdrivers are the link between the transportation industry and its customers. Goods may be shipped between terminals or warehouses in different cities by trucks, trains, ships, or planes. But the initial pickup from factories and the consolidation of cargo at terminals for intercity shipment, as well as final delivery of goods from terminals to stores and homes, usually are made by truck. Local truckdrivers are skilled drivers who can maneuver trucks into tight parking spaces, through narrow alleys, and up to loading platforms.

When local truckdrivers arrive at the terminal or warehouse, they receive assignments from the dispatcher to make deliveries, pickups, or both. They also get delivery forms and check the condition of their trucks. Before the drivers arrive for work, material handlers generally have loaded the trucks and arranged the items in order of delivery to minimize handling of the merchandise.

At the customer's place of business, drivers generally load or unload the merchandise. If there are heavy loads or many deliveries to make during the day, drivers may have helpers. Drivers of moving vans usually have crews of helpers to assist in loading and unloading household or office furniture.

Drivers get customers to sign receipts for the goods and may receive money for the material delivered. At the end of the day, they turn in receipts, money, and records of deliveries made and report mechanical problems with their trucks.

The work of drivers varies, depending on the product they transport. Produce truckers usually pick up a loaded truck in the early morning and spend the rest of the day delivering produce to many different grocery stores. The day for a driver of a lumber truck, on the other hand, consists of several round trips between the lumber yard and one or more construction sites.

## Working Conditions

Local truckdrivers frequently work 48 hours or more a week. Many who handle food for chain grocery stores, produce markets, or bakeries drive at night or early in the morning. Although most drivers deliver over regular routes, some have different routes each day.

Truckdriving has become less physically demanding because most trucks now have more comfortable seating, better ventilation, and improved cab designs, but making many deliveries during a day can still be exhausting. Moreover, driving in heavy traffic can cause nervous strain. Local truckdrivers, unlike long-distance drivers, usually can return home in the evening.

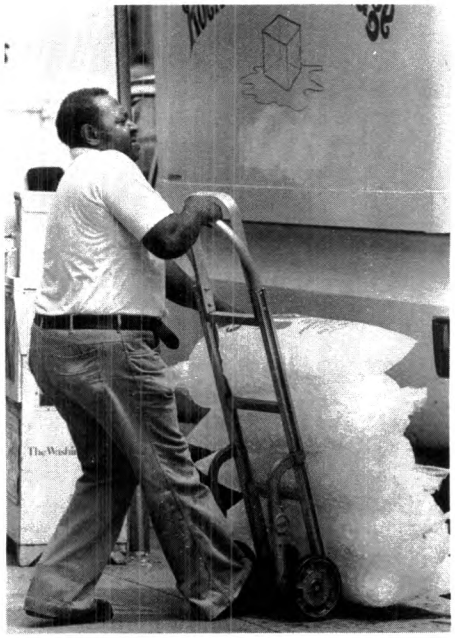
## Employment

About 1.7 million people worked as local truckdrivers in 1980, mostly in and around large cities. Some drivers are employed in almost all communities, however.

Most local drivers work for businesses which deliver their own products and goods, such as department stores, foodstores, and lumber yards. Many others are employed by trucking companies. Some work for Federal, State, and local government agencies.

## Training, Other Qualifications, and Advancement

Qualifications for local truckdrivers vary considerably, depending upon the type of truck and the nature of the employer's business. In most States applicants must have a chauffeur's license, which is a commercial



Local truckdrivers usually unload their own cargo when making deliveries.

driving permit. Information on how to get this license can be obtained from State motor vehicles department. Applicants may have to pass a general physical examination, a written examination on driving regulations, and a driving test. They should have good hearing and at least 20/40 vision with or without glasses, be able to lift heavy objects, and be in good health.

Employers prefer applicants with some previous experience driving a truck. Consideration is given to driving experience in the Armed Forces. A person also may obtain experience by working as a truckdriver's helper. Truckdrivers often let their helpers drive part of the day. When driving vacancies occur, senior helpers usually are promoted.

A more common method of entering truckdriving is to start out as a dockworker, loading and unloading freight. Dockworkers get a general idea of the trucking operation, and their work may give them the opportunity to move trucks around the yard. When a need for a truckdriver develops, a capable dockworker may be promoted. New drivers often start on panel or other small "straight" trucks. As they gain experience and show good driving skills, they may advance to larger and heavier trucks, and finally to tractor-trailers.

Since drivers often deal directly with the company's customers, the ability to get along well with people is important. Employers also look for responsible, self-motivated individuals, since drivers work with little supervision. Many employers will not hire applicants who have bad driving records.

Training given to new drivers usually is informal and may consist only of a few hours of instruction from an experienced driver, sometimes on the new employee's own time.

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New drivers also may ride with and observe experienced drivers before being assigned their own runs. Additional training may be given if they are to drive a special type of truck. Some companies give 1 to 2 days of classroom instruction which covers general duties, the operation and loading of a truck, company policies, and the preparation of delivery forms and company records.

Although most new drivers are assigned immediately to regular driving jobs, some start as extra drivers and do the work of regular drivers who are ill or on vacation. They receive a regular assignment when an opening occurs.

Local truckdrivers may advance to dispatcher, manager, or to traffic work—for example, planning delivery schedules. However, relatively few of these jobs are available. For the most part, a local truckdriver may advance to driving heavy or special types of trucks or by transferring to long-distance truckdriving. Local drivers working for companies that also employ long-distance drivers have the best chances of advancing to these positions.

## Job Outlook

Employment of local truckdrivers is expected to increase about as fast as the average for all occupations through the 1980's. Anticipated growth in business activity will result in more freight to be distributed. Since trucks carry virtually all local freight, employment of drivers is expected to increase. In addition to the job openings from growth in demand for truckdrivers, thousands of openings will result from the need to replace experienced drivers who transfer to other occupations, retire, or die.

Many people are attracted to this field because earnings are high and no formal training is required. Consequently, applicants may face competition for available jobs during the 1980's. Applicants with good driving records have the best chance of being hired.

Job openings for truckdrivers may vary from year to year since the number of drivers needed fluctuates with general business conditions. Many new truckdrivers are hired when the economy and the volume of freight are growing, but few are hired when they are not. During recessions, when freight volume decreases, some drivers are laid off and others work fewer hours. Those in industries such as wholesale food distribution, which is usually not affected much by recessions, are less likely to be laid off.

## Earnings

As a rule, local truckdrivers are paid by the hour and receive extra pay for working overtime, usually after 40 hours. On the average, local truckdrivers earned $8.71 an hour in 1980, about one-third higher than the average for all nonsupervisory workers in private industry, except farming. Earnings of local truckdrivers vary greatly, depending on the size truck they drive. In 1980, earnings ranged from an average of $6.17 an hour paid drivers of light trucks to an average of $9.63 an hour paid tractor trailer drivers.

Many local truckdrivers are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.). Some local truckdrivers employed by companies outside the trucking industry are members of unions that represent the plant workers of their employers.

## Related Occupations

Other driving occupations with duties similar to those of local truckdrivers are local busdrivers, long-distance truckdrivers, hostlers, route drivers and deliverers.

## Sources of Additional Information

Information on truckdriver training schools and on career opportunities in the trucking industry may be obtained from:

American Trucking Associations, Inc., 1616 P St. NW., Washington, D.C. 20036.

For details on truckdriver employment opportunities, contact local trucking companies or the local office of the State employment service.

# Long-Distance Truckdrivers

(D.O.T. 903.683-010 through -018, 904.383-010 and .683-010, 905.483-010 and .663-018)

## Nature of the Work

At all hours of the day and night, big trucks travel along turnpikes, freeways, and highways carrying goods between terminals hundreds, or even thousands, of miles apart. Behind the wheel are the top professional drivers. They drive the largest and most expensive equipment and receive the highest wages of all drivers.

The runs of long-distance truckdrivers vary widely. Some drivers have short "turnarounds." They deliver a load to a nearby city, pick up another loaded trailer, and drive it back to their home base the same day. Others are assigned runs that take an entire day, and they remain away from home overnight. Often on longer runs, drivers are assigned loads going to other cities rather than back to their home bases and may continue to haul loads from city to city for as long as a week before returning home. Some companies use two drivers on very long runs. One drives while the other sleeps in a berth behind the cab. These "sleeper runs may last for days, or even weeks at a time.

Some drivers have regular runs, transporting freight to the same city on a regular basis. But demand for trucking service fluctuates; shippers request varying amounts of service to different cities every day. Therefore, many drivers have unscheduled runs. Dispatchers tell these drivers when to report for work and where to haul the freight.

When drivers report for work, the trucks already have been loaded with cargo and serviced with fuel and oil. But, before moving from the terminal, drivers inspect the trucks they will drive to make sure the trucks will operate safely. For example, the drivers make sure the brakes, windshield wipers, and lights are working and that a fire extinguisher, flares, and other safety equipment are aboard. Drivers adjust mirrors so that both sides of the truck are visible from the driver's seat, and make sure the cargo has been loaded properly so it will not shift during the trip. If some equipment does not work, or is missing, or if the cargo is not loaded properly, drivers report the problem to the dispatcher for correction.

Once they are on the road, drivers must be alert not only to prevent accidents, but also to drive their trucks efficiently. Because of the truck's size, drivers sit higher than the cars, pickups, and vans around them and have the advantage of being able to see far down the road. They seek traffic lanes that allow them to move at a steady speed, and when going downhill, they may increase speed slightly to gain momentum for a hill ahead.

After they reach their destination, drivers complete reports about the trip and the condition of the truck, as required by the U.S. Department of Transportation. If they have had an accident during the trip, a detailed report of the incident is required.

Long-distance truckdrivers spend most of their working time behind the wheel. Drivers hauling some specialty cargo, though, often load or unload their trucks, since they may be the only individuals at the destination familiar with this procedure. Auto transport drivers, for example, drive and position the cars on the racks and remove them at the final destination. Gasoline tank truckdrivers attach the hoses and operate the pumps on their trucks to transfer the gasoline to gas stations' storage tanks. When picking up or delivering furniture, drivers of long-distance moving vans hire local workers to help them load or unload.

## Working Conditions

Trucking companies engaged in interstate commerce are subject to the U.S. Department of Transportation rules governing hours of work and other matters. These regulations limit the hours drivers may work and assure a reasonable amount of time for rest. For example, a driver cannot be on duty for more than 60 hours in any 7-day period and cannot drive more than 10 hours without being off duty at least 8 hours. Many drivers, particularly on long runs, work close to the maximum hours permitted. Drivers on long runs may face boredom and fatigue. Although many drivers work during the day, night travel is common and frequently preferred because roads are less crowded and trips take less time.

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## Employment

An estimated 575,000 long-distance drivers were employed in 1980. Most live near large cities and manufacturing centers that have many truck terminals. Drivers who specialize in transporting agricultural products or minerals may live in rural areas.

A large proportion of long-distance truckdrivers work for trucking companies that offer transportation service to businesses in general. Many others work for companies, such as furniture manufacturers, which own and operate trucks to deliver their specific products. A significant number of drivers are owner-operators. They own their trucks and either operate independently, serving a variety of businesses, or lease their services and their trucks to a trucking company.

## Training, Other Qualifications, and Advancement

The U.S. Department of Transportation establishes minimum qualifications for long-distance truckdrivers who are engaged in interstate commerce. A driver must be at least 21 years old and pass a physical examination, which the employer usually pays for. Good hearing, 20/40 vision with or without glasses, normal use of arms and legs (unless a waiver is obtained), and normal blood pressure are the main physical requirements.

Employers seek people with good driving records who can pass a road test operating the type of vehicle driven in regular service. In addition, they must take a written examination on the Motor Carrier Safety Regulations of the U.S. Department of Transportation. In most States, truckdrivers also must have a chauffeur's license, which is a commercial driving permit.

The hiring standards at many trucking operations are higher than those described. Many firms require that new drivers be at least 25 years old. Others specify height and weight limitations. Some companies employ only applicants who have had several years' experience driving trucks long distances.

Long-distance truckdrivers spend most of their working time behind the wheel.

Driver-training courses are a desirable method of preparing for truckdriving jobs. Most training authorities and employers recommend high school driver-training courses. In addition, a high school course in automotive mechanics helps drivers make minor roadside repairs.

A small number of private and public technical-vocational schools offer truckdriving courses. Students learn to inspect the trucks and freight, to drive large vehicles in crowded areas and in highway traffic, and to comply with Federal, State, and local regulations. Completion of a course, however, does not assure a job. Graduates of these schools who do get truckdriving jobs often start as local drivers. Persons interested in attending one of these schools should check with local trucking companies to make sure the school's training is acceptable to them.

A more common method of entering truckdriving is to start as a dockworker, loading and unloading freight at a loading dock. Experienced dockworkers may advance to local truckdriving jobs. New drivers often start on panel or other small "straight" trucks. As they gain experience and show good driving skills, they may advance to heavier trucks and finally to tractor-trailers. Local drivers with tractor-trailer experience are good candidates for long-distance jobs. Graduates of truckdriving schools who cannot get jobs as drivers sometimes apply to become dockworkers. If they are hired, their school experience gives them an advantage over other dockworkers when driving vacancies occur.

New drivers usually are given a brief explanation of company policy and are taught how to prepare forms used on the job. They also receive a small amount of driving instruction and practice on a training course to learn how to maneuver these larger trucks. They then make one or more training trips under the supervision of an instructor or an experienced driver.

Drivers for large trucking companies frequently start on the "extra board." The extra board is a list of drivers, assigned in rotation, who make the many unscheduled trips or who substitute for drivers unable to make their scheduled runs.

Some individuals enter trucking by purchasing a truck and going into business for themselves. While many of these owner-operators are successful, a large number fail to cover expenses and eventually lose their trucks. Individuals interested in becoming owner-operators should have good business sense as well as some truckdriving experience. Courses in accounting, business, and business arithmetic are helpful.

Opportunities for promotion in this occupation are limited. A few drivers may advance to jobs as safety supervisor, driver supervisor, and dispatcher. However, such jobs often are unattractive to long-distance truckdrivers, since the starting pay usually is less than the pay for driving. Most drivers can only expect to advance to driving runs that provide increased earnings or preferred schedules and working conditions.

## Job Outlook

Employment of long-distance truckdrivers is expected to increase about as fast as the average for all occupations through the 1980's. The general economic growth of the Nation is expected to increase the amount of freight that will be carried long distances by truck, thus increasing the demand for drivers. But the demand for drivers is expected to increase more slowly than the growth in freight because larger trucks should increase the amount of freight each driver can haul. In addition to jobs created by growth in demand for drivers, thousands of openings will also occur in this large occupation as experienced drivers transfer to other fields of work, retire, or die. Since driver earnings are high and no formal training is required, applicants can expect to face strong competition for available jobs.

Job opportunities may vary from year to year because the amount of freight moved by trucks fluctuates with the economy. Many new truckdrivers are hired when the economy and the volume of freight are expanding, but few when they decline. During slowdowns in the economy, some truckdrivers are laid off and others work fewer hours, decreasing their earnings.

## Earnings

Based on limited information, drivers employed by large trucking companies had estimated annual average earnings of about $26,900 in 1980. Pay rates are fairly uniform because this field is highly unionized, and union contracts generally are master agreements covering all employers within a multi-State region. However, the earnings of individual drivers vary, depending on mileage driven, number of hours worked, and type of truck.

Some companies outside the trucking industry that operate trucks such as bakeries and dairies pay their drivers on the same basis as they pay their other employees—a monthly, weekly, or daily wage. Generally, such a wage is for a specified number of hours; if drivers work additional hours, they receive extra pay. A workweek of at least 50 hours is very common.

Most long-distance drivers are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.). Some drivers outside the trucking industry belong to the unions that represent plant employees of the companies for which they work.

## Related Occupations

Other driving occupations with duties similar to those of long-distance truckdrivers are intercity busdrivers, local truckdrivers, and hostlers.

## Sources of Additional Information

Information on truckdriver training schools and career opportunities in the trucking industry may be obtained from:

American Trucking Associations, Inc., 1616 P St. NW., Washington, D.C. 20036.

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# Other Transportation and Material Moving Occupations

## Airplane Pilots

(D.O.T. 196.167-010, .223-010 through .263-022, .263-030, -034, and -042)

### Nature of the Work

Pilots are skilled, highly trained professionals who fly planes to carry out a wide variety of tasks. Most pilots transport passengers and cargo, while others perform tasks such as crop dusting, testing aircraft, and taking photographs.

Except on small aircraft, two pilots usually are needed to fly the plane. Generally, the most experienced pilot (called captain by the airlines) is in command and supervises the other crew members on board. The copilot assists in communicating with air traffic controllers, monitoring the instruments, and flying the plane. Most large airliners have a third pilot in the cockpit who serves as flight engineer. The flight engineer assists the other pilots by monitoring and operating many of the instruments and systems, making minor inflight repairs, and watching for other aircraft.

Before departure, pilots plan their flights carefully. They confer with dispatchers and weather forecasters to find out about weather conditions en route and at their destination. Based on this information, they choose a route, altitude, and speed that should provide the fastest, safest, and smoothest flight. When flying under instrument flight rules, the pilot in command must file an instrument flight plan with air traffic control so that the flight can be coordinated with other air traffic.

Before taking off, pilots thoroughly check their planes to determine that the engines, controls, instruments, and other systems are working properly. They also make sure that baggage or cargo has been loaded correctly.

Takeoff and landing are the most difficult parts of the flight and require close coordination between the pilot and copilot. For example, as the plane accelerates for takeoff, the pilot concentrates on the runway while the copilot scans the instrument panel. To calculate the speed they must attain to become airborne, pilots on large airplanes consider the altitude of the airport, outside temperature, weight of the plane, and the speed and direction of the wind. The moment the plane reaches this speed, the copilot informs the pilot who then pulls back on the controls to raise the nose of the plane.

Unless the weather is bad, the actual flight is relatively easy. Pilots steer the plane along their planned route and are monitored by the air traffic control stations they pass along the way. They continuously scan the instrument panel to check their fuel supply and the condition of their engines. Pilots may request a change in altitude or route if circumstances dictate. For example, if the weather briefing led the pilots to expect a smoother ride than is being experienced, they may ask air traffic control if pilots flying at other altitudes have reported better conditions. If so, they may request a change. This procedure also may be used to find a stronger tailwind or a weaker headwind to save fuel and increase speed.

If visibility is poor, pilots must rely completely on their instruments. Using the readings on the altimeter, they know how high above ground they are and can fly safely over mountains and other obstacles. Special navigation radios give pilots precise information which, with the help of special maps, tells them their exact position. Other very sophis-

Earnings of airline pilots are among the highest in the Nation.

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ticated equipment provides directions to a point just above the end of a runway and enables pilots to land completely "blind."

Once on the ground, pilots must complete records on their flight for their company and the Federal Aviation Administration (FAA).

Airline pilots have the services of large support staffs and consequently perform few nonflying duties. Pilots employed by businesses that use their own aircraft, however, usually are the businesses' only experts on flying and consequently have many other duties. For example, since pilots understand the requirements for a balanced load, the business pilot loads the plane and handles all passenger luggage. While the plane is being refueled, the pilot stays with it to assure that the job is done properly. Other nonflying responsibilities include keeping records, scheduling flights, arranging for major maintenance, and performing minor maintenance and repair work on their planes.

Some pilots are instructors. They teach their students the principles of flight in ground-school classes and demonstrate how to operate aircraft in "dual-controlled" planes.

A few specially trained pilots employed by the airlines are "examiners" or "check pilots." They periodically fly with each airline pilot and copilot to make sure that they are proficient.

## Working Conditions

By law, airline pilots cannot fly more than 85 hours a month or more than 1,000 hours a year. Most airline pilots actually fly less than 70 hours a month and, although they have additional nonflying duty hours, usually only work 16 days a month. However, the majority of flights involve layovers away from home. When pilots are away from home, the airlines provide hotel accommodations and an allowance for expenses. Airlines operate flights at all hours of the day and night, so work schedules often are irregular. Pilots who have little seniority may be assigned night or early morning flights.

Pilots employed outside the airlines often have irregular schedules; they may fly 30 hours one month and 90 hours the next. Since these pilots frequently have many nonflying responsibilities, they have much less free time than airline pilots. Except for business pilots, most pilots employed outside the airlines do not remain away from home overnight. They may work odd hours, however. Instructors, for example, often give lessons at night or on weekends.

All pilots are subject to certain risks and inconveniences involved in flying. Airline pilots, especially those on international routes, often suffer jet lag—disorientation and fatigue caused by many hours of flying through different time zones. The work of test pilots, who check the flight performance of new and experimental planes, may be dangerous. Agricultural pilots must work with toxic chemicals and often do not have the benefit of a regular landing strip.

Although flying does not involve much physical effort, the mental stress of being responsible for a safe flight, no matter what the weather, can be very tiring. Particularly during takeoff and landing, pilots must be alert and ready to act if something goes wrong.

## Employment

About 82,000 civilian pilots worked in 1980. Nearly one-half worked for the airlines. Many others worked as flight instructors at local airports or for large businesses that use their own airplanes to fly company cargo and executives. Some pilots flew small planes for air taxi companies, usually to or from lightly traveled airports not serviced by the airlines. Others worked for a variety of businesses performing tasks such as crop dusting, inspecting pipelines, or conducting sightseeing trips. Federal, State, and local governments also employed pilots. Several thousand pilots were self-employed.

## Training, Other Qualifications, and Advancement

All pilots who are paid to transport passengers or cargo must have a commercial pilot's license from the FAA. To qualify for this license, applicants must be at least 18 years old and have at least 250 hours or more of flight experience. They also must pass a strict physical examination to make sure that they are in good health and have 20/20 vision with or without glasses, good hearing, and no physical handicaps that could impair their performance. Applicants must pass a written test that includes questions on the principles of safe flight, navigation techniques, and FAA regulations. They also must demonstrate their flying ability to FAA examiners.

In addition to a commercial license, pilots who have to fly in bad weather must be licensed by the FAA to fly by instruments. Pilots may qualify for this license by having 40 hours of experience flying by instruments, passing a written examination on procedures and FAA regulations covering instrument flying, and demonstrating their ability to fly by instruments.

Airline pilots must fulfill additional requirements. They must pass FAA written and flight examinations to earn a flight engineer's license. Captains must have an airline transport pilot's license. Applicants for this license must be at least 23 years old and have a minimum of 1,500 hours of flying experience including night and instrument flying.

All licenses are valid as long as a pilot can pass the required physical examinations and the periodic tests of flying skills demanded by government and company regulations.

Flying can be learned in military or civilian flying schools. Either kind of training satisfies the flight experience requirements for licensing. The FAA has certified about 1,400 civilian flying schools, including a few colleges and universities that offer degree credit for pilot training. Persons in the military gain substantial experience on jet aircraft, which airlines and many businesses prefer. Having lost many pilots to the airlines in recent years, the military hopes to curb unacceptable rates of attrition through financial incentives. Consequently, the airlines may increasingly seek pilots experienced in general aviation.

Pilots hired by airlines must be high school graduates; however, most airlines require 2 years of college and prefer to hire college graduates. Because pilots must be able to make quick decisions and accurate judgments under pressure, airline companies reject applicants who do not pass required psychological tests.

New airline pilots usually start as flight engineers. Although airlines favor applicants who already have a flight engineer's license, they may train those who have only the commercial license. All new pilots receive several weeks of intensive training in simulators and classrooms before being assigned to a flight.

Companies other than airlines generally do not require as much flying experience. However, a commercial pilot's license is required and companies prefer applicants who have experience in the type of plane they will be flying. New employees generally start as copilots. Test pilots often are required to have an engineering degree.

Advancement for all pilots generally is limited to other flying jobs. Many pilots start as flight instructors, building up their flying hours while they teach. As they become more experienced, these pilots occasionally fly charter planes and perhaps get jobs with small air transportation firms, such as air taxi companies. Some advance to business flying jobs. A small number get flight engineer jobs with the airlines.

In the airlines, advancement usually depends on seniority provisions of union contracts. After 5 to 10 years, flight engineers advance according to seniority to copilot and, after 10 to 20 years, to captain. Seniority also determines which pilots get the more desirable routes. In a nonairline job, a copilot may advance to pilot and, in large companies, to chief pilot in charge of aircraft scheduling, maintenance, and flight procedures.

## Job Outlook

Employment of pilots is expected to increase about as fast as the average for all occupations through the 1980's. In addition to jobs created by growth in demand for pilots, openings will result as experienced pilots die, retire, or leave the occupation. Competition for job openings should be keen, however, because the number of qualified pilots seeking jobs is expected to exceed the number of openings.

In the long run, the expected growth in airline passenger and cargo traffic will create a need for more airliners, more pilots, and more flight instructors. Businesses are expected to operate an increasing number of planes and employ more pilots to fly cargo to locations that the scheduled airlines do not

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service. However, the increasing use of advanced communications systems that include video links and computers may limit growth in business travel by corporate executives.

In the short run, however, employment of pilots is sensitive to cyclical swings in the economy. During slow periods when a decline in the demand for air travel forces airlines to curtail the number of flights, airlines may furlough some pilots. During recessions, commercial and corporate flying, flight instruction, and testing of new aircraft also decline, adversely affecting pilots employed in those areas.

Because wages are lower outside the airlines, there is not as much competition for these jobs. Still, flying is a popular activity, so there usually are more applicants than openings even for these positions.

Recent college graduates who have experience flying jet aircraft and who have a commercial pilot's license and a flight engineer's license can expect first consideration for jobs with the major airlines. Businesses generally have fewer formal education and experience requirements than airlines. However, these companies prefer applicants with experience in the type of plane they will be flying on the job.

## Earnings

Earnings of airline pilots are among the highest in the Nation. In 1980, the average salary for airline pilots was $67,000 a year. Starting salaries for flight engineers averaged $14,400 a year, while some senior captains on the largest aircraft earned as much as $110,000. Earnings depend on factors such as the type, size, and speed of the plane, and the number of hours and miles flown. Extra pay is given for night and international flights.

Generally, pilots working outside the airlines earn lower salaries. According to a survey conducted by the American Management Associations, average salaries for chief pilots ranged from about $31,000 to $40,000 a year in 1980; for captains/pilots, $24,000 to $36,000 a year; and for copilots, $21,000 to $26,000 a year. Usually, pilots who fly jet aircraft earn higher salaries than non-jet pilots.

Airline pilots generally are eligible for life and health insurance plans. They also receive retirement benefits and, if they fail their FAA physicals, disability payments. Some airlines provide allowances to pilots for purchasing and cleaning their uniforms. As an additional benefit, pilots and their immediate families usually are entitled to reduced fare transportation on their own and other airlines. Most airline pilots are members of the Air Line Pilots Association, International. Those employed by one major airline are members of the Allied Pilots Association. Many flight engineers are members of the Flight Engineers' International Association.

## Related Occupations

Helicopter pilots need skills and perform duties similar to those of airplane pilots. Although they are not in the cockpit, air traffic controllers and dispatchers also play an important role in making sure flights are safe and on schedule, and participate in many of the decisions pilots must make.

## Sources of Additional Information

Information about job opportunities in a particular airline, and the qualifications required, may be obtained by writing to the personnel manager of the airline. Addresses of airline companies are available from:

Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

For information about the duties as well as the physical and educational requirements for airline pilots and flight engineers, request *Pilots and Flight Engineers*, publication GA-300-122 (include a self-addressed mailing label), from:

U.S. Government Printing Office, Library and Statutory Distribution Service, 5208 Eisenhower Ave., Alexandria, Va. 22304.

For information on airline pilots, contact:

Airline Pilots Association, 1625 Massachusetts Ave. NW., Washington, D.C. 20036.

For a copy of *List of Certificated Pilot Schools*, write to:

U.S. Department of Transportation, Publications Section, M-443.1, Washington, D.C. 20590.

For information about job opportunities in companies other than airlines, consult the classified section of aviation trade magazines and apply to companies that operate aircraft at local airports.

# Merchant Marine Officers

## Nature of the Work

Every ship has jobs of such importance to its safe operation that the persons doing them are identified as having special responsibilities. These persons are the ship's officers.

In command of every oceangoing merchant vessel is the *captain* or *master* (D.O.T. 197.167-010), who is the shipowner's sole representative. The captain has complete authority and responsibility for the ship's operation and the safety of the crew, passengers, cargo, and vessel.

In port, the captain may serve as the shipowner's agent in conferring with custom officials and, in some cases, may act as paymaster for the ship. Although not technically a member of a specific department, the captain usually has been promoted from the deck department and generally is associated with it.

**Deck Department**. Deck officers or "mates," as they are traditionally called, direct navigation of the ship and supervise the cleaning and maintenance of the deck and hull. They maintain the authorized speed and course; plot the vessel's position; post lookouts for other ships; record information in the "log" of the voyage; and immediately notify the captain of any unusual occurrences. To comply with Coast Guard regulations for ensuring the safe and efficient operation of ships, deck officers must be familiar with modern navigational equipment, such as sonar, radar, and radio directional finders.

The *chief mate* (D.O.T. 197.133-022), also known as the first mate or chief officer, is the captain's key assistant and assigns duties to the deck crew and maintains order and discipline. The chief mate also plans and supervises the loading and unloading of cargo, and assists the captain in taking the ship in, to and out of port. On some ships, the chief mate may be in charge of first-aid treatment.

By tradition, the *second mate* (D.O.T. 197.133-022) is the navigation officer. The second mate sees that the ship is provided with the necessary navigation charts and that its navigation equipment is maintained properly.

*Third mates* (D.O.T. 197.133-022), the most junior-rated deck officers, act as signal officers and are in charge of all signaling equipment. They also assist in the supervision of cargo loading and unloading. The third mate frequently inspects the ship's lifesaving equipment to be sure it is ready for use in fire, shipwreck, or other emergencies.

**Engine Department**. Marine engineers operate all engines aboard ship. They also inspect the engines and other equipment and ensure that required repairs are made. They also make sure proper steam pressure and oil and water temperatures are maintained. The *chief engineer* (D.O.T. 197.130-010) supervises the engine department, and is responsible for the efficient operation of engines and other mechanical equipment. The chief engineer oversees the fuel consumption and operation of the ship's main powerplant and auxiliary equipment.

The *first assistant engineer* (D.O.T. 197.130-010) supervises engineroom personnel and directs operations such as starting, stopping, and controlling the speed of the main engines. The first assistant engineer also oversees and inspects the lubrication of engines, pumps, generators, and other machinery and, with the aid of the chief engineer, directs all types of repairs.

The *second assistant engineer* (D.O.T. 197.130-010) has charge of the boiler and associated equipment such as the water-feed system and pumps. The second assistant engineer also supervises the cleaning of boilers.

The *third assistant engineer* (D.O.T. 197.130-010) supervises the operation and maintenance of the lubrication system and other engineroom equipment. Some third assistant engineers are responsible for the electrical and refrigeration systems aboard ships.

*Other officers*. A ship keeps contact with the shore and other vessels through its *radio officer* (D.O.T. 193.262-022), who also maintains radio equipment. These officers send and receive messages by voice or Morse

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Captain plots vessel's course.

code and monitor the emergency frequency for distress calls. They periodically receive and record time signals, weather reports, position reports, and other information. Radio officers also may maintain depth recording equipment and electronic navigation equipment.

Some freighters and all passenger vessels carry *pursers* (D.O.T. 197.167-014). The purser, or staff officer, does the extensive paperwork that is required before a ship enters or leaves a port. The purser prepares payrolls and assists passengers, as required. To improve the medical care aboard freighters and facilitate U.S. Public Health Service clearance when a ship arrives in port, some pursers have been trained as physicians' assistants by the Staff Officers Association, a union of pursers. On passenger ships, these duties are performed by doctors and nurses.

## Working Conditions

An officer working in the engineroom must be able to withstand high temperatures while a deck officer must be able to adapt to both bitter cold and the hot sun.

The accommodations for officers aboard U.S. vessels are generally excellent. However, some officers find being confined to a ship for long periods of time boring.

## Employment

An estimated 13,000 officers were employed aboard U.S. oceangoing merchant vessels during 1980. Due to long vacations and other breaks in service such as those resulting from illness, about two officers are employed for every job on a ship.

Nearly three-fifths of all officers were aboard freighters and most of the remainder were aboard tankers. Only a small percentage were on combination freighter-passenger vessels.

## Training, Other Qualifications, and Advancement

Applicants for an officer's license in the deck or engineering departments of oceangoing vessels must meet certain legal requirements. Captains, chief and second mates, and chief and first assistant engineers must be at least 21 years old. The minimum age for third mates, third assistant engineers, and radio operators is 19. In addition, applicants must present proof of U.S. citizenship and obtain a U.S. Public Health Service certificate attesting to their vision, color perception, and general physical condition.

Besides meeting legal and medical requirements, candidates must also have at least 3 years of appropriate sea experience or graduate from an approved training program. Deck officer candidates must pass Coast Guard examinations that require extensive knowledge of navigation, cargo handling, and deck department operations. Marine engineering officer candidates must demonstrate in-depth knowledge of propulsion systems, electricity, plumbing and steam fitting, metal shaping and assembly, and ship structure. To advance to higher ratings, officers must pass progressively more difficult examinations.

For a Coast Guard license as a radio officer, applicants must have a first- or second-class radiotelegraph operator's license issued by the Federal Communications Commission. For a license to serve as the sole radio operator aboard a cargo vessel, the Coast Guard also requires 6 months of radio experience at sea.

Unlike most professions, merchant marine officers do not have to meet minimum education requirements. A sailor with 3 years' experience in the deck or engine department may apply for either a third mate's license or for a third assistant engineer's license. However, because of the complex machinery and navigational and electronic equipment on modern ships, formal training usually is needed to pass the Coast Guard's examination for these licenses.

The fastest and surest way to become a well-trained officer is through an established training program. Such programs are available at the U.S. Merchant Marine Academy at Kings Point, N.Y., and at six State merchant marine academies: California Maritime Academy, Vallejo, Calif.; Great Lakes Maritime Academy, Traverse City, Mich.; Maine Maritime Academy, Castine, Maine; Massachusetts Maritime Academy, Buzzards Bay, Mass.; Texas Maritime Academy, Galveston, Tex.; and State University of New York Maritime College, Fort Schuyler, N.Y. About 550 students graduate each year from the State schools; about one-half are trained as deck officers and one-half as marine engineers. The U.S. Merchant Marine Academy now selects about 10 percent of the approximately 250 persons who enter the academy each year to be trained as "omnicompetent" officers. They are taught both navigational and technical skills so they can work in either the deck or engine department. Admission to the U.S. Merchant Marine Academy is through nomination by a member of Congress, whereas entrance to the other academies is made through written application directly to the school.

Most of the academies offer 4-year programs in nautical science or marine engineering, which include courses such as navigation, mathematics, electronics, propulsion systems, electrical engineering, naval architecture, languages, history, and shipping management, as well as practical experience at sea. After Coast Guard examinations are passed, licenses are issued for either third mate or third assistant engineer. In addition, graduates may receive commissions as ensigns in the U.S. Naval Reserve.

New legislation requires that, beginning in 1986, graduates of the U.S. Merchant Marine Academy must serve at least 5 years in the merchant marine or the military.

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Because of their thorough grounding in theory and its practical application, academy graduates are in the best position to move up to master and chief engineer ratings. Their well-rounded education also helps qualify them for shoreside jobs such as marine superintendents, operating managers, design engineers, naval architects, or shipping executives.

A number of trade unions in the maritime industry provide officer training. However, the number of qualified ships' officers graduating from union-sponsored schools has been reduced significantly since the end of the Vietnam War. Of the several training schools created during the 1960's, all but the National Marine Engineers' Beneficial Association (MEBA)-operated Calhoon Engineering School in Baltimore, Md., have restricted training programs to upgrading officers already licensed. The Calhoon School grants a third assistant engineer's license to about 80 graduates each year. Its 3-year program consists of both classroom instruction and sea experience. Two years are spent at the school in Baltimore; the third year is spent aboard various merchant ships. A correspondence course is completed during the sea training phase. The classroom training consists of such courses as steam engineering, diesel engineering, electrical engineering, math, physics, chemistry, and welding. Students are provided with free room, board, medical care, and textbooks in addition to a monthly grant. Trainees must agree to serve at least 3 years in the merchant marine after the 3-year training period.

A small number of unlicensed sailors who show exceptional ability are selected for union-sponsored programs of self-study which enable them to obtain either a third mate's license or a third assistant engineer's license.

Advancement for deck and engine officers is along well-defined lines and depends primarily upon specified sea experience, passing a Coast Guard examination, and leadership ability. Deck officers start as third mates. After 1 year's sea service, they are eligible to take a second mate examination. A second mate may apply for a chief mate's license after 1 year of sea service. Officers in the engine department start as third assistant engineers. After 1 year of service, they may apply for a second assistant's license and finally a chief engineer's license.

## Job Outlook

Little or no change in the employment of ships' officers is expected through the 1980's.

From the end of World War II through the mid-1970's, the number of vessels in our merchant marine declined steadily as owners of American ships found it advantageous to register them outside the country. In recent years, however, the size of our fleet has stabilized and is expected to increase slightly through the 1980's because the Federal Government has taken steps to ensure that ships registered in the United States and operated by American crews are available to transport essential cargo. To maintain this capability, the Government sometimes pays the difference in wages if U.S. crews instead of foreign crews are used, and helps pay for the construction of ships.

Some job openings will occur as a result of the need to replace experienced workers who take shoreside employment, retire, or die. Replacement needs are relatively high because ships' officers are somewhat older, on the average, than workers in other occupations and the liberal pension plans offered by the merchant marine industry encourage early retirement. Also, some officers find they prefer the stability of shoreside employment.

Job opportunities are expected to be favorable through the 1980's because the demand for officers is expected to roughly equal the number of graduates from officer training schools.

Job opportunities for merchant marine officers are expected to be excellent in related maritime fields. For example, the expanded interest in offshore mineral and oil exploration should generate a greater need for trained officers to work on oceanographic research and oil exploration vessels.

Federal Government policy could alter the job outlook. On the one hand, should the Government require that a fixed proportion of imported oil or exported grains be carried in American ships—a move that would require American crews—employment opportunities could increase significantly. On the other hand, should the Government reduce subsidies to American ship owners, employment would decline.

## Earnings

Earnings of officers depend upon their rank and the type of ship. Wages are highest on large ships. The accompanying table shows monthly base wages for officers aboard an average freighter in 1980. Additional payments for overtime or for assuming extra responsibilities generally average about 50 percent of base pay. For example, a second mate with a monthly base pay of $2,074 may regularly earn about $3,110 each month.

**Table 1. Monthly base wages for merchant marine officers, December 1980**

| Occupation | Base pay[1] |
|---|---|
| Captain | $5,386 |
| Chief engineer | 4,895 |
| First assistant engineer | 2,926 |
| First mate | 2,926 |
| Radio officer | 2,368 |
| Second assistant engineer | 2,074 |
| Second mate | 2,074 |
| Third assistant engineer | 1,863 |
| Third mate | 1,863 |
| Purser | 1,443 |

[1]East Coast wages aboard a single-screw ship of 12,000-17,000 power tons.

SOURCE: U.S. Department of Transportation, Maritime Administration.

Officers and their dependents enjoy substantial pension and welfare benefits. Vacations range from 18 to 30 days for each 30 days of employment. Officers with 20 years of service have the option of a monthly pension of $325 or 40 percent of their monthly rate of pay. Those who have 25 years of service are eligible for $425 a month or 50 percent of their monthly rate. Officers forced to retire prematurely due to a permanent disability receive partial pensions. Comprehensive medical care and hospitalization are provided for officers and their families through employer or union programs.

The workweek aboard ship is considerably different from the workweek on shore. At sea, most officers are required to work 7 days a week. Generally, they work two 4-hour watches (shifts) during every 24-hour period and have 8 hours off between each watch. Some officers work 8 hours a day, Monday through Friday. All officers are paid overtime for work over 40 hours a week. When the ship is in port, the basic workweek is 40 hours for all crewmembers.

Almost all officers belong to maritime unions. The two largest are the International Organization of Masters, Mates and Pilots, representing deck officers, and the National Marine Engineers' Beneficial Association, representing engineering officers. The Staff Officers Association and the Marine Staff Officers Association represent pursers aboard certain freighters. Radio officers are represented by the American Radio Association and the Radio Officers Union. In addition, a number of independent unions organize officers on tankers. Many officers' unions require initiation fees which range from $1,000 to $5,000.

## Related Occupations

Occupations having responsibilities and duties similar to merchant marine officers include fishing vessel captains, yacht masters, ship pilots, tugboat captains and mates, dredge captains and mates, ferryboat captains, passenger barge masters, riverboat masters, quartermasters, and barge captains.

## Sources of Additional Information

For general information about merchant marine officers' jobs, write to:

Office of Maritime Labor and Training, Maritime Administration, U.S. Department of Transportation, 400 7th Street, SW., Washington, D.C. 20590.

Information about job openings, qualifications for employment, wage scales, and other particulars is available from local maritime officers' unions. If no maritime union is listed in the local telephone directory, contact:

International Organization of Masters, Mates and Pilots, 39 Broadway, New York, N.Y. 10006.

National Marine Engineers' Beneficial Association, 444 North Capitol St., Washington, D.C. 20001.

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# Merchant Marine Sailors

## Nature of the Work

Sailors make up most of a merchant ship's crew and do most of the manual labor. Employment is along craft lines with varying skill levels. Each worker is assigned to one of the following departments: Deck, engine, or steward's.

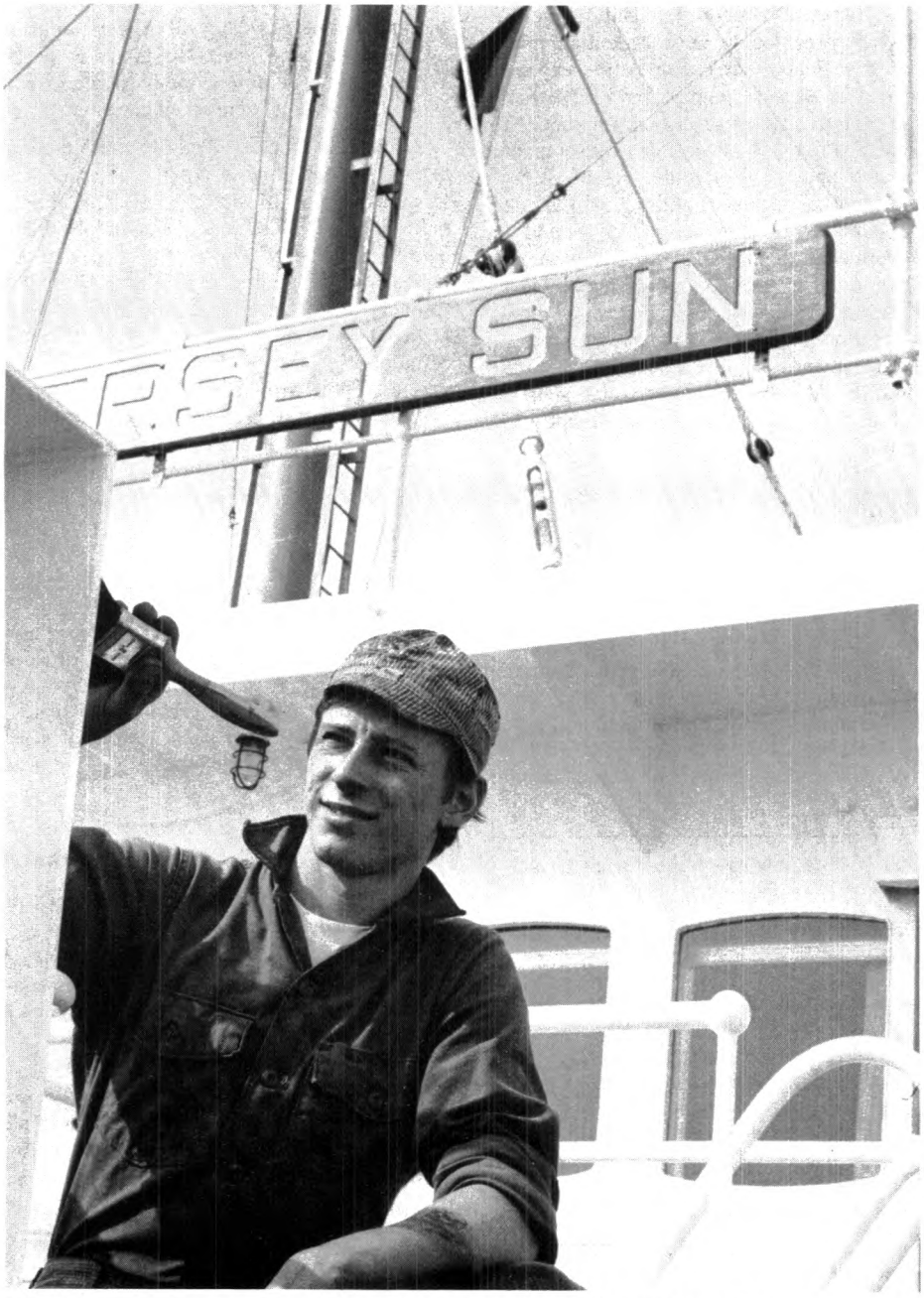
**Deck Department**. *Ordinary seamen* (D.O.T. 911.687-030), the entry rating in the deck department, scrub decks, coil and splice ropes, paint, clean living quarters, and do other general maintenance work. They also may relieve able seamen who steer the ship and act as lookouts to watch for other ships.

*Able seamen* (D.O.T. 911.364-010) must have a thorough knowledge of all parts of the ship and be able to handle all gear and deck equipment. At times, they act as quartermasters and steer the ship and serve as lookouts.

Able seamen also are responsible for rigging, repairing, and stowing cargo-handling and other gear. They must be able to tie common knots and handle mooring lines when the ship is docking or departing. Able seamen also are required to be familiar with fire prevention and control methods. They participate in periodic boat drills and are trained in all operations connected with launching lifeboats and liferafts. In addition to their more skilled tasks, they do general deck maintenance work similar to that done by ordinary seamen.

The *boatswain* (D.O.T. 911.131-010), or bosun, is the highest ranking able seaman. As boss of the deck crew, the boatswain relays the deck officers' orders and sees that these orders are carried out. The boatswain assists the chief mate in assigning work to crew members and directs general maintenance operations such as cleaning decks and polishing metalwork. When the ship docks or anchors, the boatswain supervises the deck crew in handling the lines used for mooring.

Some cargo vessels carry a *deck utility hand* (D.O.T. 911.687-022) to maintain the ship's decks under the supervision of the boatswain and determine the condition of bilges (compartments in the bottom of the hull) and do general maintenance work.




Aboard ocean-going ships, general maintenance work is performed by sailors.

**Engine Department**. The engineering staff consists of workers who have a variety of occupational specialties requiring varying degrees of skill, from the entry rating of wiper to specialized skilled jobs such as refrigerator engineer. *Wipers* (D.O.T. 699.687-014) keep the engineroom and machinery clean. Most cargo vessels carry one to three wipers. *Oilers* (D.O.T. 911.584-010) lubricate mechanical equipment. They make regular rounds of ship machinery to check oil flow and pressures. Oilers also may help overhaul and repair machinery. *Firers-watertenders* (D.O.T. 951.685-018) check and regulate the amount of water in the boilers, inspect gauges, and regulate fuel flow to keep steam pressure constant. They also check the operation of evaporators and condensers, which are used to convert salt water to fresh water.

The *ship's electrician* (D.O.T. 825.281-014) repairs and maintains electrical equipment, such as generators and motors. Electricians also test wiring for short circuits and remove and replace fuses and defective lights.

Certain types of ships require workers who have special skills, such as *refrigeration engineers* (D.O.T. 950.362-014) who maintain proper temperatures in refrigerator compartments for perishable cargoes such as meat and vegetables.

**Steward's Department**. The *chief steward* (D.O.T. 350.137-014) supervises the preparation and serving of meals and the upkeep of living quarters aboard ship. The chief steward also assists the *chief cook* (D.O.T. 315.131-010) in planning menus and is responsible for ordering new supplies. The chief cook and assistant cooks prepare meals. The chief cook also supervises the other galley (ship's kitchen) workers and is responsible for keeping the galley clean and orderly. *Utility hands* (D.O.T. 318.687-014) and *mess attendants* (D.O.T. 350.677-010) complete the crew in the steward's department. These beginning jobs require little skill. Utility hands carry food supplies from the storeroom and refrigerators, prepare vegetables,

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wash cooking utensils, and scour galley equipment. Mess attendants set tables, serve meals, clean tables, wash dishes, and care for living quarters.

Due to the greater use of prepackaged foods and smaller crew sizes, many new ships have reduced the number of workers in the steward's department. For example, the chief cook and chief steward may be replaced by a combination chief steward/cook.

## Working Conditions

A person working in an engineroom must be able to withstand high temperatures while a deck worker must be able to adapt to both bitter cold and the hot sun. Able seamen may have to stand for considerable periods at a time while serving as lookouts.

Accommodations for sailors aboard U.S. vessels are generally good, but not luxurious. Meals are served in a messroom, which often doubles as a recreation room where the crew can read, write letters, play cards, and socialize. Crew members generally share quarters aboard older ships and have little privacy, but most new ships have single-berth rooms. Many sailors find the work aboard ship routine and boring.

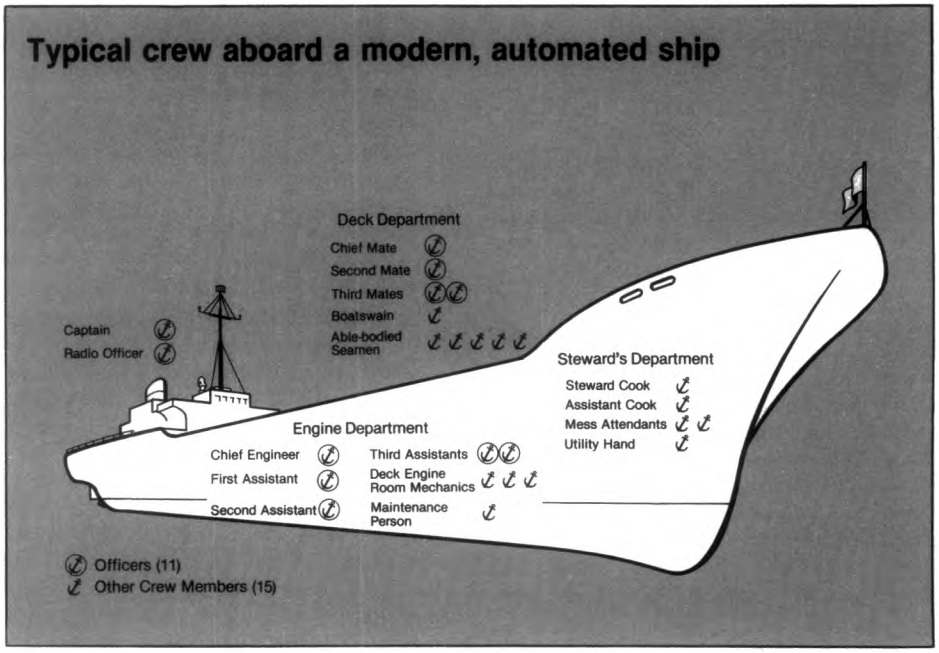
## Employment

An estimated 24,000 sailors were employed aboard U.S. oceangoing vessels during 1980. Due to long vacations and other breaks in duty, such as illness, the number of employed sailors is about 1.5 times the number of jobs on ships. Over one-half of the jobs were aboard freighters, and most of the remainder were aboard tankers. Only a small percentage were on combination freighter-passenger ships.

## Training, Other Qualifications, and Advancement

Although not required, previous sea experience in the Coast Guard or Navy is a useful background for entering the merchant marine. Applicants must obtain a doctor's certificate specifying they are in good health. Applicants without previous experience at sea then must obtain a letter from a shipping company stating that, if qualified, they will be hired if a job becomes available. Those who have had service at sea in the U.S. Navy, U.S. Coast Guard, Military Sealift Comand, or the U.S. Army Transportation Corps may present an approved transcript of such services in place of a letter of commitment. In addition, all applicants must register with the U.S. Coast Guard and acquire from it universal identification papers called a merchant mariner's document. The document, however, does not guarantee a job. It merely qualifies a person to be considered for a job when the supply of regular workers has been exhausted.

For commercial vessels, the National Maritime Union and the Seafarers' International Union operate employment offices along the Atlantic, Pacific, and Gulf Coasts and the Great Lakes, and the Sailors' Union of the Pacific operates in many ports on the West Coast. For Government-operated ships, the Navy's Military Sealift Command (MSC) has employment offices in Bayonne, N.J. and Oakland, Calif.




Jobseekers are given shipping cards when they register at the employment offices. When shipping companies send job orders to the employment office, sailors who have been unemployed the longest get first preference on any jobs for which they are qualified. Inexperienced applicants are likely to have difficulty getting jobs at the present time because the number of experienced workers exceeds the number of job openings. Applicants must be present at the employment office when jobs are announced and may lose their places if they are not present or have turned down three job offers.

A sailor advances in the deck and engine departments by serving a designated period in a rating, and by successfully completing a Coast Guard examination that tests ability to use and maintain equipment. For example, after serving a minimum of 1 year aboard an oceangoing vessel, an ordinary seaman may apply to the Coast Guard for limited endorsement as an able seaman. However, due to the shortage of jobs, maritime unions in recent years have required that seamen take all accumulated vacation time after 6 or 7 months of sea duty. As a result, it now generally takes at least 22 months for an ordinary seamen to obtain an able seaman's certificate. For full endorsement, applicants must be at least 19 years of age and have passed an examination that tests their knowledge of seamanship and ability to carry out all the duties required of able seamen. Able seamen who have supervisory ability may advance to boatswain after years of service.

Most training programs in the industry are designed to help experienced workers upgrade their ratings. Upgrading courses for sailors are offered by the Seafarers' International Union, the National Maritime Union, and a number of other organizations.

A small number of persons who show exceptional ability are selected for union-sponsored programs of self-study which enable unlicensed sailors to advance to the licensed officer ranks as either third mate or third assistant engineer.

A sailor advances in the steward's department by serving a designated period in a rating and by successfully completing job advancement training. A mess attendant or utility hand can advance to third cook, to cook-baker, to chief cook, and finally to chief steward. The Seafarers' International Union and the National Maritime Union operate programs which train individuals for jobs in the steward's department.

## Job Outlook

Employment of merchant marine sailors is expected to decline through the 1980's. Some job openings, however, will arise each year due to the need to replace experienced sailors who retire, die, or quit the sea for other reasons. Competition for these positions is expected to be keen because the number of people seeking jobs as sailors probably will exceed openings. Most openings will be filled by experienced sailors who are unemployed; very few inexperienced applicants are expected to get jobs.

Employment opportunities in the U.S. Merchant Marine are directly related to the number of American ships—and to the number of sailors required to operate each ship. At the end of World War II, the United States possessed the largest merchant marine fleet ever assembled. Since then, however, the number of ships declined until recently as some owners transferred their ship's registration outside the country.

The number of American ships is expected to increase slightly through the 1980's because the Federal Government has taken steps to insure that ships registered in the United States and operated by American crews are available to transport essential car-

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go. To maintain this capability, the Government pays the difference in wages to a company if they use American crews, rather than foreign crews, and helps pay for the construction or purchase of new merchant ships.

Despite the expected increase in the size of our fleet, employment of sailors is expected to decline because new ships are operated with smaller crews. For example, older, nonautomated vessels generally carry a crew of twelve sailors in the engineering department, whereas new, automated ships only carry four—three deck engine mechanics and one wiper. Deck engine mechanics replace oilers, firer-watertenders, and electricians. Older freighters and tankers customarily employ three ordinary seamen, whereas these jobs have been eliminated on some newer ships. In addition, mechanization of tasks has eliminated jobs for carpenters, and the use of prepackaged food and smaller crew sizes have reduced the number of cooks and stewards needed.

Some job opportunities for merchant marine sailors are expected in related maritime fields. For example, the expanded interest in offshore mineral and oil exploration should generate some demand for sailors to work on oceanographic research and oil exploration vessels.

Federal Government policy could alter the job outlook. Employment opportunities may improve if the Government requires that a fixed proportion of imported oil or exported grains be carried in American ships—a move that would require more American ships. Conversely, should the Government reduce subsidies to American shipowners, employment would decline.

## Earnings

Crew members of American merchant ships enjoy excellent pay and fringe benefits. Earnings depend on job assignments and type of vessel. Basic monthly pay for a cross-section of ratings on a typical freighter in 1980 is shown in the accompanying table.

**Table 1. Monthly base wages for merchant marine sailors, December 1980**

| Occupation | Base pay[1] |
|---|---|
| Electrician | $1,732 |
| Chief steward | 1,472 |
| Carpenter | 1,354 |
| Chief baker | 1,275 |
| Deck utility hand | 1,251 |
| Able seaman | 1,121 |
| Firer-watertender | 1,120 |
| Oiler | 1,120 |
| Ordinary seaman | 874 |
| Mess attendant/utility hand | 868 |

[1]East Coast wages aboard a single-screw ship of 12,000-17,000 power tons.

SOURCE: U.S. Department of Transportation, Maritime Administration.

Monthly wages are supplemented by premium pay for overtime and other factors. On the average, premium earnings are equal to about 50 percent of base wages. For example, an oiler with a monthly base pay of $1,120 regularly earns about $1,680 each month.

Liberal employer-financed fringe benefits are provided. Vacations range from 5 to 15 days for each 30 days of employment. Sailors may retire on pensions after 20 years of service. Sailors and their dependents are covered by comprehensive medical care and hospitalization programs.

The workweek aboard ship is considerably different from the workweek on shore. At sea, most sailors are required to work 7 days a week. Generally, they work two 4-hour watches (shifts) during every 24-hour period and have 8 hours off between each watch. Some sailors are day workers. They work 8 hours a day, Monday through Friday. All sailors are paid overtime for work over 40 hours a week. When the ship is in port, the basic workweek is 40 hours for all crew members.

Sailors are represented by a number of labor organizations; the two largest are the National Maritime Union of North America and the Seafarers' International Union of North America.

## Related Occupations

Other occupations involved with helping to operate and maintain a vessel include ferryboat operators, hatchtenders, boat loaders, barge hands, ferryboat deck hands, pilot-boat deckhands, and tugboat deckhands.

## Sources of Additional Information

For general information about merchant marine sailors' jobs, write to:

Office of Maritime Labor and Training, Maritime Administration, U.S. Department of Transportation, 400 7th Street, SW., Washington, D.C. 20590.

Information about job openings, qualifications for employment, wage scales, and other particulars is available from local maritime unions. If no maritime union is listed in the local telephone directory, contact:

National Maritime Union of North America, 346 West 17th St., New York, N.Y. 10011.

Seafarers' International Union of North America, 675 Fourth Ave., Brooklyn, N.Y. 11232.

# Operating Engineers (Construction Machinery Operators)

(D.O.T. 850.662-010, -014, .663-014, -018, and -022; .683 exc. -014, 851.663-010; 853.663-010, -014, and -022; .683-010, -014, and -018; 859.362-010, .682-010, -014, and -018; .683 exc. -018; 869.683-010, -014, and -018; 921.663-014, -030, -054, -058,-062)

## Nature of the Work

Lifting and positioning a quarter-ton pane of glass by crane into an 8-foot by 10-foot window opening 10 stories above the ground require considerable skill. At the crane's controls is an operating engineer. Operating engineers also work the controls of bulldozers, trench excavators, paving machines, and many other types of specialized machinery used at construction sites. Some workers know how to operate many kinds of machines; other workers, only a few. Because the skills and training required vary, operating engineers usually are classified by the type of machines they operate. The following paragraphs discuss the duties of operators of three commonly used types of equipment: Tower cranes, bulldozers, and air compressors.

Tower cranes are used to lift and move building materials around a construction site. The crane operator climbs a ladder inside the crane's mast—a tall steel tower—to the control booth that is located beneath the crane's boom—a long steel arm perpendicular to the mast. The operator must accurately judge distances and heights and push or pull a number of buttons, levers, and pedals in proper sequence to pick up and deliver materials. These controls rotate the boom around the mast, and raise and lower a cable with a hook that lifts heavy objects. At times, the operator may not see either the pickup or delivery point and must follow the hand or flag signals and radio commands of another worker.

Bulldozers gouge out, level, and distribute earth, and remove trees, rocks, and debris from land before building starts. Bulldozer operators generally handle fewer controls than crane operators, and since the "dozer" operator works at ground level, estimating distances is less of a problem.

The operator raises or lowers the "blade" attached to the front of the "dozer" by pushing a button or by pushing or pulling a lever. To clear land, a bulldozer operator lowers the blade to the ground, shifts to forward gear and presses a pedal for power, causing the blade to scrape and level the ground. The operator will back up and repeat the process until the land is cleared and graded.

Air-compressor operators tend machines that take in air and force it through a a narrow hose to run special "air" tools, such as jackhammers. Before starting an air compressor, the operator checks for tight hose connections and may manually pump air through the compressor to check for leaks. The operator also makes sure the compressor has fuel and water. The operator then starts the air compressor and allows it to build sufficient pressure to operate efficiently. While the compressor is running, the operator periodically checks fuel, water, and pressure levels. At the end of the workday, the operator turns the compressor off and "bleeds off" pressure in the air hose by opening an air pressure release valve. This allows an easy start the next time the compressor is to be used.

Operating engineer helpers, sometimes called "oilers," make sure the machines have

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gas and oil and are properly lubricated. Helpers also make minor repairs and adjustments. Experienced operators who are working alone also perform these tasks. Major repairs, however, usually are made by heavy-equipment mechanics.

## Working Conditions

Operating engineers work outdoors, in both hot and cold weather. However, they do not work in rain or snow. Operating some machines, particularly bulldozers and some types of scrapers, is physically tiring because the constant movement of the machine shakes or jolts the operator. Also, most machines are noisy. In addition, operating engineers can be injured in accidents involving the equipment. Tower crane operators, for example, may fall as they climb to or from the crane's control booth.

## Employment

Approximately 270,000 operating engineers were employed in 1980. Many worked for general building contractors in highway, dam, airport, and other large-scale construction projects. Others worked for utility companies, manufacturers, and other business firms that do their own construction work, as well as State and local highway and public works departments. Less than one-tenth were self-employed, a smaller proportion than in most building trades.

Operating engineers are employed in every section of the country, both in large cities and in small towns. Some work in remote locations on construction projects, such as highways and dams.

## Training, Other Qualifications, and Advancement

Most individuals learn the trade by beginning as truckdrivers or helpers. They may do simple tasks such as cleaning, greasing, and starting machines. Then, under an experienced operator, they learn to repair and operate light equipment. Later, they may learn to operate larger equipment such as bulldozers and cranes. Most training authorities recommend completion of a 3-year formal apprenticeship as the best way to become an operating engineer. Since apprentices learn to operate a variety of machines, they have better job opportunities.

The apprenticeship program consists of at least 3 years of on-the-job training and 144 hours a year of related classroom instruction. The programs are administered by union-management committees of the International Union of Operating Engineers and the Associated General Contractors of America, and by local chapters of the Associated Builders and Contractors.

Apprentices are classified into one of three groups: Universal equipment operators, grade and paving operators, and plant equipment operators. On the job, trainees are taught to operate, maintain, and repair various types of construction equipment and machinery. In the classroom, apprentices receive instruction in engine operation and repair, cable splicing, hydraulics, welding, and safety and first aid.

Employers prefer to hire high school graduates who are at least 18 years old. Courses in driver education and automobile mechanics and experience in operating tractors and other farm machinery are helpful.

A number of private vocational schools offer instruction in the operation of certain types of construction equipment. Completion of such a program may help a person get a job as a trainee or apprentice. However, persons considering such training should check the reputation of the school among construction employers in the area.

Operating engineers need to be alert and have a good sense of balance as well as good eye-hand-foot coordination and physical strength.

Advancement for operating engineers generally is limited to increases in pay. Some operating engineers may become supervisors.

## Job Outlook

Job opportunities for operating engineers should be plentiful over the long run. Employment in this occupation is expected to grow about as fast as the average for all occupations through the 1980's. Population and business growth will lead to the construction of more factories, houses, office buildings, and other structures. More operating engineers also will be needed in maintenance work on roads and highways.

Besides the job openings created by increased demand for operating engineers, many openings will arise as experienced workers transfer to other occupations, retire or die. Jobs should be easiest to find during spring and summer since construction picks up as the weather becomes warmer. Because construction activity is sensitive to ups and downs in the economy, the number of job openings may fluctuate from year to year. When construction activity declines, however, operating engineers who are laid off may be able to find jobs in other industries.

## Earnings

Hourly rates for all operating engineers ranged from $11 to $14 in 1980. These rates are about twice the average for all nonsupervisory and production workers in private industry, except farming. Persons operating light equipment such as air compressors have slightly lower wages. Operating engineers working in less populated areas earn less. Annual earnings generally are lower than hourly wage rates would indicate because the annual number of hours worked can be adversely affected by poor weather and fluctuations in construction activity. Hourly wage rates for apprentices start at about 70 percent of the full rate paid to experienced workers and increase periodically.

Many operating engineers are members of the International Union of Operating Engineers.

To grade land, operating engineers must handle the controls precisely.

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## Related Occupations

Agriculture, mining, manufacturing, public utilities, and transportation are other industries that use a lot of specialized machinery to move earth and materials. Other occupations in which workers operate such equipment include: bridge-or-gantry-crane operators, coke loaders, continuous mining machine operators, conveyor operators, derrick operators, locomotive-crane operators, longwall mining machine tenders, oil well perforator operators, roof bolters, stevedores, and yarding engineers.

## Sources of Additional Information

For further information about apprenticeships or work opportunities in this occupation, contact a local of the International Union of Operating Engineers; a local apprenticeship committee; or the nearest office of the State apprenticeship agency. In addition, the local office of the State employment service may provide information about apprenticeship and other programs that provide training opportunities.

For general information about the work of operating engineers, contact:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

International Union of Operating Engineers, 1125 17th St. NW., Washington, D.C. 20036.

Associated Builders and Contractors, 444 N. Capitol St., Suite 409, Washington, D.C. 20001.

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# Helpers, Handlers, Equipment Cleaners, and Laborers

Helpers, handlers, equipment cleaners, and laborers assist skilled workers and perform the routine tasks required to complete a project. These workers are employed in nearly every industry and geographic area of the Nation.

Helpers assist machine operators and tenders who work with metal, wood, plastic, textiles, and other materials. Some helpers aid workers who fabricate, assemble, and hand finish manufactured goods. Others help workers who inspect, test, examine, and sample raw materials and finished products. Mechanic and repairer helpers aid in adjusting, maintaining, and repairing tools, equipment, and machines. In the construction trades, helpers and laborers work with bricklayers, carpenters, electricians, painters, surveyors, and others to build and maintain buildings, roads, bridges, and other projects. Still other helpers assist in drilling oil wells, blasting, and cutting materials to be mined.

Most handlers, equipment cleaners, and laborers manually lift and carry materials in production activities. Garbage collectors gather refuse for disposal. Stevedores load and unload ships' cargoes. Stock handlers sort and place tools, equipment, and other materials. Baggers package groceries. Machine feeders deposit or remove materials from machines or equipment. Fuel pump attendants and lubricators fill gas tanks, check engine oil and air pressure in tires, clean windshields, and do other routine services on cars and trucks in garages and gasoline service stations. Parking lot attendants park cars at lots and garages. Many industries need cleaners to help maintain the appearance and function of vehicles and equipment. Other workers pack materials for shipment and storage.

Millions of workers are employed as helpers, handlers, equipment cleaners, and laborers. The following tabulation provides 1980 employment estimates for several of the larger occupations in this cluster.

| | |
|---|---|
| Helper, trades | 955,000 |
| Production packager | 609,000 |
| Fuel pump attendant and lubricator | 401,000 |
| Shipping packer | 346,000 |
| Bagger | 235,000 |
| Garbage collector | 117,000 |
| Vehicle cleaner | 116,000 |
| Surveyor helper | 56,000 |
| Rotary drill operator helper | 40,000 |

Because their jobs require little skill, helpers, handlers, equipment cleaners, and laborers have minimal education requirements. They usually learn their duties on the job or in short training sessions given by the employer.

These workers must be in excellent physical health since most jobs require frequent bending, stooping, and heavy lifting. Jobs may require outdoor work, sometimes in uncomfortable weather conditions. Occupational hazards include cuts, burns, and sore or strained muscles.

Jobs as helpers, handlers, equipment cleaners, and laborers are expected to be plentiful due to the very high turnover rate in these occupations. However, some of these workers may be laid off during recessions. This is particularly common among construction laborers and others working in industries that are sensitive to cyclical swings in the economy. Also, some workers may lose their jobs as routine tasks are mechanized.

Many helpers, handlers, equipment cleaners, and laborers earn relatively low wages. Supervisors and workers who belong to unions, however, can expect to earn higher wages. Many workers, such as construction laborers, do not earn any wages when weather or economic conditions prevent them from working.

Detailed information on the nature of the work, employment, training requirements, job outlook, earnings, and working conditions for construction laborers—the largest of the helper, handler, equipment cleaner, and laborer occupations—is presented in the following statement.

## Construction Laborers

### Nature of the Work

Construction laborers provide much of the routine physical labor on all types of construction and demolition projects. They erect and dismantle scaffolding, set braces to support the sides of excavations, and clean up rubble and debris. Laborers also help unload and deliver materials, machinery, and equipment to carpenters, masons, and other construction workers. Because they perform a wide variety of jobs, laborers are employed during all phases of a construction project.

Some construction laborers have job titles that indicate the kinds of work they do. Bricklayers' tenders and plasterers' tenders, both commonly known as hod carriers, help bricklayers and plasterers by mixing and supplying materials, setting up and moving portable scaffolding, and providing many other services. Hod carriers must be familiar with the work of bricklayers and plasterers and know the materials and tools they use. Some hod carriers also help cement masons.

Another group of laborers, pipelayers, lay sewer and other large, nonmetal pipe and seal connections with concrete and other materials.

Recent years have seen much mechanization of laborers' tasks. Thus, laborers now may operate such things as motorized lifts and ditch-diggers of the "walk-behind" variety, various kinds of small mechanical hoists, as well as laser beam equipment to align and grade ditches and tunnels.

Although some construction laborers' jobs require only a few basic skills, many jobs require training and experience, as well as a broad knowledge of construction methods, materials, and operations. Rock blasting, rock drilling, and tunnel construction are examples of work in which "know-how" is important. Laborers who work with explosives must know the effects of different explosive charges under varying rock conditions to prevent injury and property damage. Laborers do almost all the work in the boring and mining of a tunnel, including operations that workers in other trades would handle for a job above ground.

### Working Conditions

Construction work is physically strenuous, since it requires frequent bending, stooping, climbing, and heavy lifting. Much of the work is performed outdoors. Construction laborers, like almost all other workers in construction occupations, are subject to falls from scaffolds; cuts, burns, and abrasions from various tools and equipment; and sore or strained muscles from heavy lifting.

### Employment

Over 1 million workers were employed as construction laborers in 1980. Most of them worked for construction contractors, State and city public works and highway departments, and public utility companies.

### Training, Other Qualifications, and Advancement

Little formal training is needed to get a job as a construction laborer. Generally, applicants must be at least 18 years old and in good physical condition.

Many new employees transfer from lower paying occupations such as farm laborer or janitor. Many other persons take jobs as con-

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Erecting scaffolding is one of many jobs performed by construction laborers.

struction laborers because no previous experience is required or the work schedule does not interfere with school, another job, or other activities.

Beginners' jobs are usually of the simplest type, such as unloading trucks and digging ditches. As workers gain experience, job assignments become more complex.

Many tasks require skills too complex for on-the-job training. As a result, contractors and unions have established 4- to 8-week formal training programs in many States to teach basic construction concepts, safety practices, and machinery operation. Some locales offer training to help experienced laborers keep abreast of technological advances.

## Job Outlook

A large number of job openings for construction laborers are expected annually through the 1980's. Although employment growth is expected to be about as fast as the average for all occupations through the 1980's, the overwhelming majority of job openings will result from the occupation's high turnover rate. Some laborers acquire informally on the job the minimum skills that enable them to move into craft jobs such as carpenter or bricklayer.

Employment of construction laborers is highly sensitive to cyclical swings in the economy, particularly to the level of construction activity. Consequently, layoffs are common among these workers when the level falls. Over the long run, however, growth in population and economic activity will spur construction. Laborers will be needed to meet the demand for moving materials, mixing and pouring concrete, and helping craft workers, particularly on large projects such as bridges, dams, high-rise buildings, and power plants.

## Earnings

According to a survey of cities with at least 100,000 inhabitants, union wage rates for construction helpers and laborers averaged $9.80 an hour in 1980, compared with $6.66 an hour for all production and nonsupervisory workers in private industry, except farming. Wage rates were generally highest in the West and lowest in the South.

Annual earnings for construction laborers generally are lower than hourly rates would indicate because poor weather and fluctuations in construction activity may adversely affect the number of hours they can work a year.

Many construction laborers are members of the Laborers' International Union of North America.

## Related Occupations

In assisting skilled craft workers, construction laborers combine strength, willingness to learn, and the ability to follow directions. Other occupations which require similar attributes are blacksmith helpers, dock hands, material handlers, quarry workers, and sand blasters.

## Sources of Additional Information

For information about work opportunities, contact local building or construction contractors, local construction associations, a local of the Laborers' International Union of North America, or the local office of the State employment service.

For general information about the work of construction laborers, contact:

Laborers' International Union of North America, 905 16th St. NW., Washington, D.C. 20006.

Laborers'-Associated General Contractors' Education and Training Fund, 1730 Rhode Island Ave. NW., Suite 909, Washington, D.C. 20036.

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# Military Occupations

The main purpose of the Armed Forces—the Army, Navy, Marine Corps, Air Force, and Coast Guard—is national defense. The Army prepares for land-based defense, while the Air Force's mission is air and space defense. The Navy organizes and trains forces for sea-based activities. The Marine Corps prepares for land and sea actions in support of naval operations. The Coast Guard, under the Department of Transportation (except in wartime, when it serves the Navy), has responsibility for enforcing Federal maritime laws and conducting rescues of distressed vessels and aircraft.

In 1980, nearly 2.1 million persons were on active duty in the Armed Forces—about 777,000 in the Army; 558,000 in the Air Force; 527,000 in the Navy; 188,000 in the Marine Corps; and 39,000 in the Coast Guard. In addition, about 2.2 million persons were in reserve units.

Military personnel are stationed throughout the United States and in many countries around the world. In the United States, the largest numbers are stationed in California, followed by Texas, North Carolina, Georgia, Florida, and the Washington, D.C. metropolitan area. About 490,000 are stationed outside the United States. Over 300,000 of these are stationed in Europe (mainly in Germany); large numbers also are in the Western Pacific area.

Although the number of jobs in the Armed Forces is not expected to increase significantly through the 1980's, opportunities for those interested in entering military occupations should be excellent. Each year thousands of persons are recruited and trained to replace those who complete their enlistment or retire.

Military personnel enjoy more job security than their civilian counterparts. Satisfactory job performance generally assures one of steady employment and earnings.

## Occupations in the Military

The range of occupations in the military is almost as wide as in civilian life. Jobs include clerical and administrative work, skilled construction trades, electrical and electronic occupations, auto repair, and hundreds of other specialties requiring varied amounts of education and training. Each year the Armed Forces give hundreds of thousands of men and women basic and advanced training that is transferable from military to civilian careers.

A list of major job categories for enlisted personnel is presented below.

**Functional Support and Administration Workers:**

—Personnel.
—Administration.
—Clerical.
—Data processing.
—Accounting, finance, and disbursing.
—Supply and logistics.
—Religious, morale, and welfare.
—Information and education.

**Electrical and Mechanical Equipment Repairers:**

—Aircraft.
—Automotive.
—Wire communications.
—Missiles, mechanical and electrical.
—Armament and munitions.
—Shipboard propulsion.
—Power-generating equipment.
—Precision equipment.
—Aircraft launch equipment.
—Other mechanical and electrical equipment.

**Craft Workers:**

—Metalworking.
—Construction.
—Utilities.
—Construction equipment operation.
—Lithography.
—Industrial gas and fuel production.
—Fabric, leather and rubber.
—Firefighting and damage control.
—Other crafts.

**Service and Supply Handlers:**

—Food service.
—Motor transport.
—Material receipt, storage, and issue.
—Law enforcement.
—Military police.
—Personal service.
—Auxiliary labor.
—Forward area equipment support.

**Infantry, Gun Crews, and Seamanship Specialists:**

—Infantry.
—Armor and amphibious.
—Combat engineering.
—Artillery/gunnery, rockets, and missiles.
—Air crew.
—Seamanship.
—Installation security.

**Electronic Equipment Repairers:**

—Radio/radar.
—Fire control electronic systems.
—Missile guidance, control, and checkout.

Seaman stands watch aboard a destroyer.

—Sonar equipment.
—Nuclear weapons equipment.
—ADP computers.
—Teletype and cryptographic equipment.
—Other electronic equipment.

**Communications and Intelligence Specialists:**

—Radio and radio code.
—Sonar.
—Radar and air traffic control.
—Signal intelligence/electronic warfare.
—Intelligence.
—Communications center operations.
—Combat operations control.

**Medical and Dental Specialists:**

—Medical care.
—Technical medical services.
—Related medical services.
—Dental care.

**Other Technical and Allied Specialists:**

—Photography.
—Mapping, surveying, drafting, and illustrating.
—Weather.
—Ordnance disposal and diving.
—Scientific and engineering aides.
—Musicians.

Although many people make the Armed Forces a career, some plan to use the skills and training obtained in military service in civilian jobs. A brief discussion of the rela-

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tion of each military job category to civilian occupations follows.

Most private businesses and government agencies require the same basic skills that are needed for *functional support and administration* jobs in military service.

Many civilian repairer jobs rely on the same basic theories and advanced troubleshooting techniques as those used in military jobs as *electrical and mechanical equipment repairers*. In some fields, however, additional civilian training may be needed.

Civilian jobs similar to the military's *craft workers* usually require completion of an apprenticeship program. Although military training and experience will not enable a veteran to forego a civilian apprenticeship, many programs give credit for skills acquired in the service.

Many jobs as *service and supply handlers* are identical to those in civilian life, and military experience is helpful in obtaining similar civilian employment.

Most jobs in the *infantry, gun crews, and seamanship specialists* group are unique to the Armed Forces. This work experience, however, may help develop leadership and supervisory skills for future civilian employment.

Although *electronic equipment repairers* generally maintain and repair specialized military equipment, most training and experience gained can relate to civilian occupations, such as electronics technician, aircraft instrument mechanic, or radar and radio repairer. The service-trained specialist may need additional training on specialized equipment to gain journey worker status in civilian employment. Again, credit sometimes is given in an apprenticeship program for skills acquired in the service.

Some *communications and intelligence specialists*, such as sonar, radar, and radio operators, may transfer their skills to civilian jobs. In general, however, these military jobs have very few or no civilian counterparts.

After leaving the military, many service-trained *medical and dental specialists* are qualified to take certification examinations for entry into civilian jobs. Civilian occupations in which service-trained individuals can become certified include: Physicians' assistants; laboratory technicians; emergency medical technicians; medical technologists; dental assistants; physical therapists; and nurses. (States allow service-trained personnel to take the Licensed Practical Nurse Examination; a few, the Registered Nurse Examination.)

*Other technical and allied specialists* include a wide range of jobs. Although many have a civilian parallel, such as photographer, meteorologist, and musician, others provide skills with limited demand in the civilian sector, such as ordnance disposal and diving.

Technician checks an aircraft's fuel supply.

## Working Conditions

Military life is more disciplined and regimented than civilian life. There are dress and grooming requirements. Certain military formalities, such as saluting superior officers, and special military laws must be followed.

Hours and working conditions vary substantially in the wide range of jobs found in military service. Most military personnel usually work 8 hours a day, 5 or 5-1/2 days a week. Some assignments, however, require night and weekend work, or require persons to be on call at all hours. Some jobs—even in non-combat situations—are more hazardous than others. Persons with such assignments normally receive additional compensation.

## Enlistment, Training, and Promotion

*General enlistment qualifications*. Although specific enlistment requirements for each service or enlistment option within a particular service may vary, all branches have certain general qualifications. Enlistees may be either single or married, but they must be between the ages of 17 and 35. All branches prefer high school graduation or its equivalent and require it for certain enlistment options. Both a written examination (Armed Services Vocational Aptitude Battery) and a physical examination are required.

*Enlistment options*. A variety of enlistment options, each involving different combinations of active and reserve duty, is available. Most active duty programs range from 3 to 6 years, with 3- and 4-year enlistments the most common. Selection depends on the individual's general and technical aptitudes and personal preference as well as the needs of the service.

Women are now eligible to enter 95 percent of all military specialties. Only fields involving combat duty are excluded.

People planning to apply the skills gained through military training to a civilian career should obtain certain information before choosing a military occupation. First, they should determine how good the prospects are for civilian employment in jobs related to the military specialty which interests them. Second, they should know the prerequisites for the related civilian job. Many occupations require licensing certification, or a minimum level of education. Those who are interested should find out whether military training is sufficient to enter the field or, if not, what additional training will be required.

Other *Handbook* statements give much information about the job outlook for civilian occupations for which military training is helpful. Additional information often can be obtained from schools, unions, trade associations, and other organizations in the field of interest, or from a school counselor. By finding this information before choosing a specific military occupation, young people entering the Armed Forces will help insure that the type of training they obtain will fit their career plans.

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*Training programs for enlisted personnel*. After a 6- to 11-week basic training period, depending on the service branch, most recruits enter formal classroom training to prepare for a specialized field of work. The remainder receive on-the-job training at their first duty assignment. For those not assigned directly to schools, formal classroom training follows on-the-job training. After initial or advanced training, recruits are sent to their service assignment.

In addition to on-duty training, military personnel may choose from a variety of educational programs. Most military installations have a tuition assistance program for personnel who wish to take courses during off-duty hours.

Each service branch also offers programs for full-time education, and provides full pay, allowances, tuition, and related fees. Courses also are available to help service personnel earn their high school equivalency diplomas. In addition, programs are being instituted to allow credit for military training courses towards associate or baccalaureate college degrees. Other programs enable enlisted personnel to take college courses and additional military training to become commissioned officers.

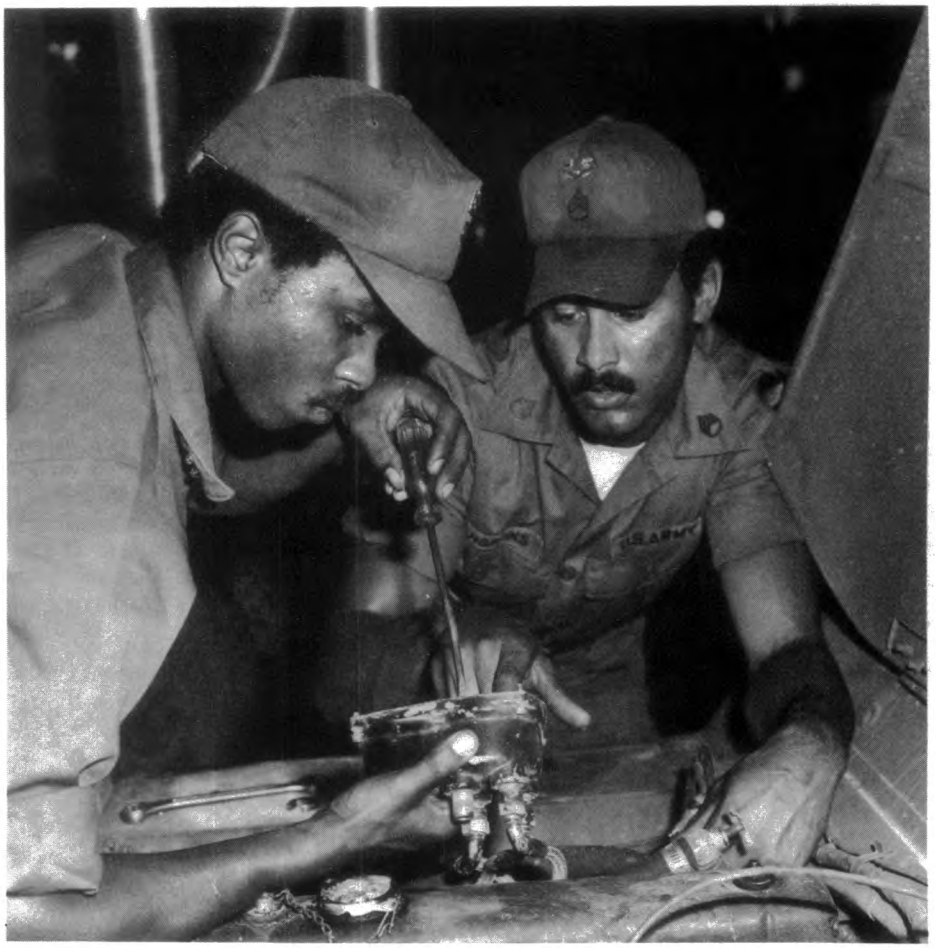
*Officer training*. Officer training in the Armed Forces is provided through the Federal Service Academies (Naval, Air Force, Military, and Coast Guard); the Reserve Officer Training Corps (ROTC); Officer Candidate School (OCS); the National Guard (State Officer Candidate School programs); and other programs.

Federal Service Academies provide a 4-year college program leading to a bachelor of science degree. The midshipman or cadet is provided free room and board, tuition, medical care, and monthly allowance. Graduates receive regular commissions and have a 5-year active duty obligation.

To become a candidate for appointment as a midshipman or cadet in the Naval, Air Force, or Military Academy, most applicants obtain a nomination from an authorized source (usually a member of Congress). Candidates do not need to know a member of Congress personally to request a nomination. Nominees must have an academic record of the requisite quality, college aptitude test scores above an established minimum, and recommendations from teachers or school officials; they also must pass a medical examination. Appointments are made from eligible nominees according to personal preference of the nominating authority and by a competitive system based on the nominees' qualifications.

Appointments to the Coast Guard Academy are made on a competitive basis. A nomination is not required.

ROTC programs train students in about 500 Army, Navy, Marine Corps, and Air Force units at participating colleges and universities. Trainees take 2 to 5 hours of military instruction a week in addition to regular college courses.



The Armed Forces train personnel in hundreds of different types of jobs.

Students in the last 2 years of a ROTC program and all those on ROTC scholarships receive a monthly allowance while attending school and additional pay for summer training. After graduation, they serve as officers on active duty for a stipulated period of time.

College graduates can earn a commission in the Armed Forces through OCS Programs in the Army, Navy, Air Force, Marine Corps, Coast Guard, and National Guard.

Persons trained in health professions may qualify for direct appointment as officers. Financial assistance is available for students training in some fields. Direct appointments also are available for those qualified to serve in other special duties, such as the judge advocate general (legal) or chaplain corps.

Flight training is available to commissioned officers in each branch of the Armed Forces.

*Promotion opportunities*. Each service has different criteria for promoting personnel. Generally, however, new enlistees are promoted from the first to the third level within the first year. Subsequent promotions are based on a more competitive system. Criteria for promotion may include time in service and grade, proficiency in assigned duties, the evaluation and recommendation of the commanding officer, and written examinations.

## Earnings, Allowances, and Benefits

In addition to basic pay, military personnel receive free room and board (or a living allowance), medical and dental care, a military clothing allowance, military supermarket and department store shopping privileges, use of recreational facilities, 30 days of paid vacation a year, and travel opportunities.

The pay grades for enlisted personnel are E-1 to E-9. The pay grades for commissioned officers are 0-1 to 0-10. Table 1 gives examples of military pay and allowances.

**Table 1. Regular military compensation[1] by grade for active members with less than 2 years of service, 1980**

| Pay grade | Compensation |
|---|---|
| Enlisted members: | |
| E-1 | $ 9,399 |
| E-2 | 10,243 |
| E-3 | 10,777 |
| E-4 | 11,544 |
| E-5 | 12,533 |
| E-6 | 14,011 |
| Commissioned officers: | |
| O-1 | 15,624 |
| O-2 | 18,373 |
| O-3 | 21,085 |
| O-4 | 22,898 |

[1]Includes basic pay and basic allowances for quarters and food.

SOURCE: U.S. Department of Defense.

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Special pay generally is awarded for unusually demanding or hazardous duties, assignments to certain areas outside the continental United States, and outstanding proficiency in the performance of duty.

Military personnel are eligible for retirement benefits after 20 years of service.

Athletic and other recreational facilities—such as libraries, gymnasiums, tennis courts, golf courses, and movies—are available on most military installations. Help with personal or financial problems is available from personal affairs officers, legal assistance officers, and chaplains, as well as supporting agencies.

*Veterans' benefits*. The Veterans Administration (VA) provides numerous benefits to those who have served in the Armed Forces. Veterans are given care in a VA hospital for service-connected disabilities; those with other medical problems can be given care if they are unable to pay the cost of hospitalization elsewhere. Veterans are eligible for certain loans, including home loans. Veterans, regardless of health, can convert a military life insurance policy to an individual policy with any participating company in the veteran's State of residence. In addition, job counseling, testing, and placement services are available.

Veterans who participated in the Veterans' Educational Assistance Program (VEAP) may receive educational benefits. Under this program, Armed Forces personnel may elect to save from $25 to $100 a month for a maximum of 36 months towards their future education. The Government will put in $2 for every $1 contributed by the service member, until the combined contributions reach a maximum of $8,100. This sum becomes the service member's fund. Upon separation from active duty, the fund can be used to finance an education at any VA-approved institution. VA-approved schools include vocational, correspondence, business, technical, and flight training schools; community and junior colleges; and colleges and universities.

Information on educational and other veterans' benefits is available from offices located in each State, the District of Columbia, Puerto Rico, and the Philippines.

## Additional Sources of Information

Each of the military services publishes handbooks and pamphlets that describe entrance requirements, training and advancement opportunities, and other aspects of military careers. These publications are available at all recruiting stations, most State employment service offices, and in high schools, colleges, and public libraries. For additional information, write to:

U.S. Army Recruiting Command, Fort Sheridan, Ill. 60037.

USAF Recruiting Service, Directorate of Recruiting Operations, Randolph Air Force Base, Tex. 78148.

Director, Personnel Procurement Division, Headquarters, U.S. Marine Corps, Washington, D.C. 20380.

Navy Opportunity Information Center, P.O. Box 2000, Pelham Manor, N.Y. 10803.

Commandant, (G-PMR), U.S. Coast Guard, Washington, D.C. 20590.

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# Dictionary of Occupational Titles (D.O.T.) Index

*Dictionary of Occupational Titles (D.O.T.)* Fourth Edition numbers referenced in the occupational statements are listed in column 1. Numbers representing the classification structure of the 1980 *Standard Occupational Classification Manual (S.O.C.)*—upon which the *Handbook's* clustering arrangement is based—are listed along side the *D.O.T.* number(s) to which they correspond.


| *D.O.T. Number* | *SOC Code* | *D.O.T. Title* | *Page* |
|---|---|---|---|
| 001.061-010 | 161 | Architect | 51 |
| -018 | 161 | Landscape architect | 53 |
| 001.261 | 372 | Drafters | 222 |
| 002.061 | 1622 | Aerospace engineers | 58 |
| 002.151 | 421 | Sales engineer, aeronautical products | 58 |
| 002.167 | 1622 | Aerospace engineers | 58 |
| 002.261-010 | | Drafter, aeronautical | 222 |
| 003.061 | 1633 | Electrical engineers | 62 |
| 003.151 | 421 | Sales engineer, electrical products | 62 |
| 003.161 | 3711 | Engineering and science technicians | 223 |
| 003.167 through .187 | 1633 | Electrical engineers | 62 |
| 003.167-030 | 1633 | Engineer-in-charge, studio operations | 221 |
| -034 | 1633 | Engineer-in-charge, studio transmitter | 221 |
| -062 | 1636 | Systems engineer, electronic data processing | 72 |
| 003.261-010 | 3711 | Instrumentation technician | 223 |
| 003.281 | 372 | Drafters | 222 |
| **005.061 through .167** | 1628 | Civil engineers | 62 |
| 005.281 | 372 | Drafters | 222 |
| 006.061 | 1623 | Ceramic engineers | 60 |
| 006.151 | | Sales engineer, ceramic products | 60 |
| 006.261 | 3719 | Engineering and science technicians | 223 |
| 007.061-010 through -022 | 1635 | Mechanical engineers | 63 |
| -026 | | Tool designer | 223 |
| -034 | 1635 | Utilization engineer | 63 |
| 007.151 | 421 | Sales engineer, mechanical equipment | 63 |
| 007.161-018 | 372 | Engineering assistant, mechanical equipment | 222 |
| -022 | 1635 | Mechanical research engineer | 63 |
| -026 | 3713 | Mechanical-engineering technician | 223 |
| -030 | 3713 | Optomechanical technician | 223 |
| -034 | 1635 | Test engineer, mechanical equipment | 63 |
| 007.167-014 | 1635 | Plant engineer | 63 |
| -022 | 1635 | Tool-drawing checker | 222 |
| 007.181-010 | 3713 | Heat-transfer technician | 223 |
| 007.261 through .281 | 372 | Drafters | 222 |
| 008.061 | 1626 | Chemical engineer | 61 |
| 008.151 | 421 | Chemical equipment sales engineer | 61 |
| 008.167 | 1626 | Technical director, chemical plant | 61 |
| 008.261-010 | 3719 | Chemical-engineering technician | 223 |
| 010.061-014 | 1624 | Mining engineer | 64 |
| -018 | 1625 | Petroleum engineer | 65 |
| -022 | 1624 | Research engineer, mining-and-oil-well equipment and services | 64 |
| -026 | 1624 | Safety engineer, mines | 41, 64 |
| 010.151.010 | 421 | Sales engineer, mining-and-oil-well equipment and services | 64 |
| 010.161.010 | 1625 | Chief engineer, research | 65 |
| -014 | 1625 | Chief petroleum engineer | 65 |
| 010.167-010 | 1625 | Chief engineer | 65 |
| -014 | 1625 | District supervisor, mud analysis well logging | 65 |
| -014 | 3833 | Observer, electrical prospecting | 223 |
| -018 | 3833 | Observer, gravity prospecting | 223 |
| -022 | 3833 | Surveyor, oil-well directional | 223 |
| 010.281-010 | 372 | Drafter, directional survey | 222 |
| -014 | 372 | Drafter, geological | 222 |
| -018 | 372 | Drafter, geophysical | 222 |
| 011.061-010 | 1623 | Foundry metallurgist | 64 |
| -014 | 1623 | Metallographer | 64 |
| -018 | 1623 | Metallurgist, extractive | 64 |
| -022 | 1623 | Metallurgist, physical | 64 |
| -026 | 1623 | Welding engineer | 64 |
| 011.161-010 | 1623 | Supervisor, metallurgical-and-quality-control-testing | 64 |
| 011.261 through .361 | 3719 | Engineering and science technicians | 223 |
| 012.061 | 1634 | Industrial engineers | 41, 63 |
| 012.061-010 | 1634 | Product-safety engineer | 223 |
| -014 | 1634 | Safety engineer | 223 |
| -018 | 1634 | Standards engineer | 63 |
| 012.067-010 | 1634 | Metrologist | 63 |
| 012.167-010 | 1634 | **Configuration management analyst** | 63 |
| -014 | 1634 | Director, quality control | 63 |
| -018 | 1634 | Factory lay-out engineer | 63 |
| -022 | 1634 | Fire-prevention research engineer | 41, 63 |
| -026 | 1634 | Fire-protection engineer | 41, 63 |
| -030 | 1634 | Industrial engineer | 63 |
| -034 | 1634 | Industrial-health engineer | 41, 63 |
| -038 | 1634 | Liaison worker, tool fabrication | 63 |
| -042 | 1634 | Manufacturing engineer | 63 |
| -046 | 1634 | Production engineer | 63 |
| -050 | 1634 | Production planner | 63 |
| -054 | 1634 | Quality-control engineer | 63 |
| -058 | 1634 | Safety manager | 41, 63 |
| -062 | 1634 | Supervisor, vendor quality | 63 |
| 012.167-066 | 1712 | Systems analyst, electronic data processing | 72 |
| -070 | 1634 | Time-study engineer | 63 |
| 012.187 | 1634 | Industrial engineers | 63 |
| 012.261-010 | 389 | Air analyst | 41 |
| 012.267-010 | 3712 | Industrial engineering technician | 223 |
| 012.281-010 | 389 | Smoke tester | 223 |
| 013.061 | 1632 | Agricultural engineer | 59 |
| 013.151-010 | 421 | Sales engineer, agricultural equipment | 59 |
| 013.161-010 | 3719 | Agricultural-engineering technician | 223 |
| 014.061 | 1637 | Mechanical engineers | 63 |
| 014.151-010 | 421 | Sales engineer, marine equipment | 63 |
| 014.167-010 | 1637 | Marine surveyor | 63 |
| -014 | 1637 | Port engineer | 63 |
| 014.281-010 | 372 | Drafter, marine | 222 |
| 015.362 through .384 | 3832 | Engineering and science technicians | 223 |
| 017 | 372 | Drafters | 222 |




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| D.O.T. Number | SOC Code | D.O.T. Title | Page |
|---|---|---|---|
| 017.281-034 | 372 | Technical illustrator | 201 |
| 018.167-010 | 3733 | Chief of party | 54 |
| -014 | 3739 | Geodetic computer | 54 |
| -018 | 1643 | Land surveyor | 54 |
| -026 | 1649 | Photogrammetric engineer | 54 |
| -034 | 3733 | Surveyor assistant, instruments | 54 |
| -038 | 1649 | Surveyor, geodetic | 54 |
| -042 | 1649 | Surveyor, geophysical prospecting | 54 |
| -046 | 1649 | Surveyor, marine | 54 |
| -050 | 1649 | Surveyor, mine | 54 |
| 018.261-018 | 3734 | Editor, map | 54 |
| -022 | 3734 | Mosaicist | 54 |
| -026 | 3739 | Photogrammetrist | 54 |
| 018.262-010 | 1644 | Field-map editor | 54 |
| 019.061-010 | 1639 | Biomedical engineer | 60 |
| 019.161-014 | 3719 | Test technician | 223 |
| 019.181-010 | 380 | Laser technician | 223 |
| 019.261-010 | 389 | Biomedical equipment technician | 223 |
| -022 | 389 | Test technician | 223 |
| 019.281-010 | 3711 | Calibration laboratory technician | 223 |
| 019.381-010 | 389 | Laboratory technician | 223 |
| 020.062-010 | 1636 | Computer-applications engineer | 72 |
| 020.067-010 | 1639 | Engineering analyst | 72 |
| -014 | 1739 | Mathematician | 70 |
| -022 | 1733 | Statistician, mathematical | 70 |
| 020.162-014 | 3971 | Programmer, business | 230 |
| 020.167-010 | 1732 | Actuary | 68 |
| -018 | 3971 | Programmer chief, business | 230 |
| -022 | 3972 | Programmer, engineering and scientific | 230 |
| -026 | 1733 | Statistician, applied | 71 |
| 020.187-010 | 3971 | Programmer, information system | 230 |
| -014 | 3974 | Programmer, process control | 230 |
| 021.067-010 | 1842 | Astronomer | 75 |
| 022.061-010 | 1845 | Chemist | 76 |
| -014 | 1845 | Chemist, food | 76 |
| 022.137-010 | 1845 | Laboratory supervisor | 76 |
| 022.161-010 | 3831 | Chemical-laboratory chief | 76 |
| 022.261-010 | 3831 | Chemical-laboratory technician | 223 |
| 022.281-014 | 3831 | Chemist, water purification | 76 |
| -018 | 3831 | Laboratory tester | 223 |
| 023.061-014 | 1843 | Physicist | 86 |
| 023.067-010 | 1843 | Physicist, theoretical | 86 |
| 024.061-010 | 1847 | Crystallographer | 80 |
| -014 | 1649 | Geodesist | 82 |
| -018 | 1847 | Geologist | 80, 84 |
| -022 | 1847 | Geologist, petroleum | 80 |
| -026 | 1847 | Geophysical prospector | 82 |
| -030 | 1847 | Geophysicist | 82, 84 |
| -034 | 1847 | Hydrologist | 80 |
| -038 | 1847 | Mineralogist | 80 |
| -042 | 1847 | Paleontologist | 80 |
| -046 | 1847 | Petrologist | 80 |
| -050 | 1847 | Seismologist | 82 |
| -054 | 1847 | Stratigrapher | 80 |
| 024.161-010 | 1847 | Engineer, soil | 80 |
| 024.167-010 | 1847 | Geophysical-laboratory chief | 82 |
| 025.062-010 | 1846 | Meteorologist | 83 |
| 025.267 | 389 | Engineering and science technicians | 223 |
| 029.067 | 1849 | Geographers | 77 |
| 029.167-010 | 389 | Aerial-photograph interpreter | 77 |
| 029.261 | 3831, 389 | Engineering and science technicians | 223 |
| 029.280-010 | 389 | Photo-optics technician | 223 |
| 029.361 through .381 | 389 | Engineering and science technicians | 223 |
| 040.061-010 | 1853 | Agronomist | 88, 89 |
| -014 | 1853 | Animal scientists | 88, 89 |
| -018 | 1853 | Dairy scientist | 88 |
| -022 | 382 | Dairy technologist | 88 |
| -030 | 1852 | Forest ecologist | 88 |
| -034 | 1852 | Forester | 92 |
| -038 | 1853 | Horticulturist | 88, 89 |
| -042 | 1853 | Poultry scientist | 88 |
| -046 | 185 | Range manager | 94 |
| -050 | 1852 | Siviculturist | 88, 92 |
| -054 | 1852 | Soil conservationist | 95 |
| -062 | 1852 | Wood technologist | 92 |
| 040.361-010 | 382 | Laboratory technician, artificial breeding | 223 |
| 041.061-010 | 1855 | Anatomist | 88 |
| -014 | 1853 | Animal breeder | 88 |
| -018 | 1853 | Apiculturist | 88 |
| -022 | 1854 | Aquatic biologist | **84**, 88 |
| -026 | 1854 | Biochemist | 76, 88, 90 |
| -030 | 1854 | Biologist | 88 |
| -034 | 1854 | Biophysicist | 86 |
| -038 | 1854 | Botanist | 88 |
| -042 | 1854 | Cytologist | 88 |
| -046 | 1853 | Entomologist | 88 |
| -050 | 1854 | Geneticist | 88 |
| -054 | 1855 | Histopathologist | 88 |
| -058 | 1854 | Microbiologist | 88 |
| -062 | 1854 | Mycologist | 88 |
| -066 | 1854 | Nematologist | 88 |
| -070 | 1855 | Parasitologist | 88 |
| -074 | 1855 | Pharmacologist | 88 |
| -078 | 1854 | Physiologist | 88 |
| -082 | 1853 | Plant breeder | 88 |
| -086 | 1854 | Plant pathologist | 88 |
| -090 | 1854 | Zoologist | 88 |
| 041.081-010 | 1853 | Food technologist | 91 |
| 041.261-010 | 1855 | Public-health microbiologist | 88 |
| 041.381-010 | 382 | Biology specimen technician | 223 |
| 045.061 through .067 | 1915 | Psychologists | 112 |
| 045.107-010 | 24 | Counselor | 30, 134, 143 |
| -018 | 24 | Director of counseling | 30, 134 |
| -022 | 1915 | Psychologist, clinical | 112 |
| -026 | 1915 | Psychologist, counseling | 30, 112 |
| -030 | 1915 | Psychologist, industrial-organizational | 112 |
| -034 | 1915 | Psychologist, school | 112 |
| -038 | 2400 | Residence counselor | 30 |
| -042 | 2400 | Vocational-rehabilitation counselor | 141 |
| 049.364-010 | 382 | Feed-research aide | 223 |
| 049.384-010 | 382 | Biological aide | 223 |
| 050.067-010 | 1912 | Economist | 104 |
| -014 | 1912 | Market-research analyist 1 | 109, 235, 236 |
| 050.117-010 | 1132 | Director, employment research and planning | 104 |
| 051.067-010 | 1914 | Political scientist | 116 |
| 052 | 1913 | Historians | 106 |
| 054.067-010 | 1916 | Research worker, social welfare | 115 |
| -014 | 1916 | Sociologist | 115 |
| 055.067 | 1919 | Anthropologists | 101 |
| 070 | 261 | Physicians | 153 |
| 070.101-046 | 261 | Medical officer | 153 |
| 071.101-010 | 261 | Osteopathic physician | 152 |
| **072.061-010** | 262 | Oral pathologist | 148 |
| 072.101-010 | 262 | Dentist | 148 |
| -014 | 262 | Endodontist | 148 |
| -018 | 262 | Oral surgeon | 148 |
| -022 | 262 | Orthodontist | 148 |
| -026 | 262 | Pedodontist | 148 |
| -030 | 262 | Periodontist | 148 |
| -034 | 262 | Prosthodontist | 148 |
| -038 | 262 | Public health dentist | 148 |
| 073.061 through .264 | 27 | Veterinarians | 156 |
| 073.264-010 | 27 | Veterinary meat inspector | 36, 156 |
| 074.161-010 | 301 | Pharmacist | 163 |
| 075.117 through .374 | | Registered nurses | 169 |

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| D.O.T. Number | SOC Code | D.O.T. Title | Page |
|---|---|---|---|
| 075.117-014 | 131 | Director, community health nursing | 169 |
| -018 | 1283 | Director, educational community health nursing | 169 |
| -022 | 131 | Director, nursing services | 169 |
| 076.101-010 | 3034 | Audiologist | 172 |
| 076.107-010 | 3034 | Speech pathologist | 172 |
| 076.121-010 | 3032 | Occupational therapist | 161 |
| -014 | 3033 | Physical therapist | 165 |
| 076.224-010 | 5233 | Physical therapist assistant | 303 |
| 076.364-010 | 5233 | Occupational therapy assistant | 301 |
| 077 | 302 | Dietitians | 160 |
| 078.121-010 | 362 | Medical technologist, teaching supervisor | 184 |
| 078.261-010 | 362 | Chemistry technologist | 184 |
| -014 | 362 | Microbiology technologists | 184 |
| 078.281-010 | 362 | Cytotechnologist | 184 |
| 078.361-010 | 363 | Dental hygienist | 175 |
| -014 | 362 | Medical technologist | 184 |
| -018 | 365 | Nuclear medical technologist | 188 |
| -030 | 362 | Tissue technologist | 184 |
| 078.362-018 | 369 | Electrocardiograph technician | 177 |
| -022 | 369 | Electroencephalographic technologist | 179 |
| -026 | 365 | Radiologic technologist | 188 |
| 078.381 | 369 | Medical laboratory workers | 184 |
| 078.687-010 | 5233 | Laboratory assistant, blood and plasma | 184 |
| 079.021-010 | 1843 | Health physicist | 41, 86 |
| -014 | 1843 | Medical physicist | 86 |
| 079.101-010 | 289 | Chiropractor | 147 |
| -018 | 281 | Optometrist | 150 |
| -022 | 283 | Podiatrist | 156 |
| 079.117-018 | 369 | Sanitarian | 36 |
| 079.127-010 | 143 | Inservice coordinator, auxiliary personnel | 43 |
| 079.161-010 | 369 | Industrial hygienist | 41 |
| 079.167-014 | 131 | Medical-record administrator | 40 |
| 079.361-010 | 3031 | Respiratory therapist | 171 |
| 079.364-014 | 369 | Optometric assistant | 302 |
| -018 | 304 | Physician assistant | 167 |
| 079.367-010 | 5233 | Medical assistant | 299 |
| -014 | 364 | Medical record technician | 186 |
| 079.371-010 | 5232 | Dental assistant | 298 |
| 079.374-010 | 369 | Emergency medical technician | 180 |
| -014 | 366 | Nurse, licensed practical | 183 |
| -022 | 369 | Surgical technician | 190 |
| 090.107-010 | 24 | Foreign-student advisor | 30 |
| 090.117-018 | 1281 | Dean of students I | 30 |
| -022 | 1281 | Director, athletic | 30 |
| -030 | 1281 | **Financial-aid officer** | 30 |
| 090.167-014 | 1281 | Director of admissions | 30 |
| -022 | 1281 | Director of student affairs | 30 |
| -030 | 1281 | Registrar, college or university | 30 |
| 090.227-010 | 22 | Faculty member, college or university | 131 |
| 091.107-010 | 1282 | **Dean of students II** | 47 |
| 091.221-010 | 233 | Teacher, industrial arts | 144 |
| 091.227-010 | 233 | Teacher, secondary school | 101, 144 |
| 092.227-010 | 232 | Teacher, elementary school | 135 |
| -014 | 231 | Teacher, kindergarten | 135 |
| 096.121 through .167 | 239, 1283 | Cooperative extension service workers | 133 |
| 099.117-018 | 1282 | Principal | 47 |
| -022 | 121 | Superintendent, schools | 47 |
| 099.224-010 | 239 | Instructor, physical education | 135, 144 |
| **.227-022** | 2249 | Instructor, military science | 144 |
| 099.327-010 | 399 | Teacher aide I | 273 |
| 100.117 through .267 | 251 | Librarians | 138 |
| 100.367-010 | 251 | Bibliographer | 138 |
| -014 | 251 | Classifier | 138 |
| -018 | 399 | Library technical assistant | 229 |
| -022 | 251 | Music librarian | 138 |
| -026 | 251 | Music librarian, international broadcast | 138 |
| 100.387-010 | 251 | Catalog librarian | 138 |
| 101.167 through 102.117 | 252 | Historians | 106 |
| 109.067-010 | 1719 | Information scientist | 72 |
| 110 | 2110 | Lawyers | 97 |
| 119.267-026 | 396 | Paralegal assistant | 227 |
| 120.007-010 | 2042 | Clergy member | 124, 125, 127 |
| 129.107-018 | 2049 | Director of religious activities | 30 |
| 131.067-010 | 3313 | Columnist/commentator | 195, 199 |
| -014 | 3313 | Copywriter | 199, 235 |
| -018 | 3313 | Critic | 199 |
| -022 | 3313 | Editorial writer | 199 |
| 131.087-010 | 321 | Continuity writer | 199 |
| -014 | 321 | Reader | 199 |
| 131.267-010 | 3313 | Newscaster | 195 |
| -014 | 3313 | Newswriter | 199 |
| -018 | 3313 | Reporter | 195, 196 |
| -022 | 3312 | Script reader | 199 |
| -026 | 3980 | Writer, technical publications | 199, 232 |
| 132 | 3312 | Writers and editors | 199 |
| 141.031-010 | 322 | Art director | 201, 235 |
| 141.061 | 322, 325 | Commercial artists | 201 |
| 141.061-010 | 325 | Cartoonist | 201 |
| -014 | 325 | Fashion artist | 201, 235 |
| -018 | 322 | Graphic designer | 201, 202, 235, 236 |
| -022 | 325 | Illustrator | 201, 235 |
| -026 | 325 | Medical Illustrator | 201 |
| 141.067-010 | 322 | Creative director | 201, 235 |
| .081-010 | 325 | Cartoonist, motion pictures | 201 |
| -014 | 322 | Commercial designer | 201 |
| 142.031-010 | 322 | Art director | 201 |
| 142.051-014 | 322 | Interior designer | 207 |
| 142.061-014 | 322 | Cloth designer | 201, 202 |
| -026 | 322 | Industrial designer | 206 |
| 142.081-010 | 322 | Floral designer | 201, 204 |
| -018 | 322 | Package designer | 201, 202 |
| 143.062-014 | 326 | Photographer, aerial | 209 |
| -026 | 326 | Photographer, scientific | 209 |
| -030 | 326 | Photographer, still | 209 |
| -034 | 326 | Photojournalist | 209 |
| 143.362-010 | 326 | Biological photographer | 209 |
| .382-010 | 326 | Camera operator | 209 |
| -014 | 326 | Photographer, finish | 209 |
| 143.457-010 | 326 | Photographer | 209 |
| 149.031-010 | 329 | Supervisor, scenic arts | 201 |
| 150.047-010 | 324 | Actor | 212 |
| 151.047-010 | 327 | Dancer | 214 |
| 152.041-010 | 323 | Musician, instrumental | 215 |
| 152.047-022 | 323 | Singer | 217 |
| 159.124-010 | 2033 | Camp counselor | 121 |
| 159.147-010 | 333 | Announcer | 195 |
| 160 | 1412, 1419, 1473, 149 | Accountants | 23 |
| 160.167-046 | 1473 | Chief bank examiner | 36 |
| 161.167-010 | 142 | Management analyst | 28 |
| 162.117-022 | 1499 | Field contractor | 46 |
| -026 | 1499 | Field contractor technician | 46 |
| 162.157-010 | 1443 | Broker-and-market operator, grain | 46 |
| -018 | 1442 | Buyer | 26 |
| -022 | 1442 | Buyer, assistant | 26 |
| -034 | 1449 | Procurement engineer | 46 |
| -038 | 1449 | Purchasing agent | 46, 235, 236 |
| 162.167-010 | 1443 | Buyer, grain | 46 |
| -014 | 1443 | Buyer, tobacco | 46 |
| -030 | 1449 | Purchase-price analyst | 46 |
| 163.117-018 | 125 | Manager, promotion | 38 |
| 163.167-010 | 125 | Manager, advertising | 235 |
| 164.117-010 | 125 | Manager, advertising | 235, 236 |
| -014 | 125 | Manager, advertising agency | 235 |


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Federal Reserve Bank of St. Louis

| D.O.T. Number | SOC Code | D.O.T. Title | Page |
|---|---|---|---|
| 164.167-010 | 125 | Account executive | 235 |
| 165.067-010 | 332 | Public-relations representative | 193 |
| .167-010 | 332 | Sales-service promoter | 193 |
| 166.067-010 | 143 | Occupational analyst | 43 |
| 166.117-010 | 123 | Director, industrial relations | 43 |
| -014 | 143 | Manager, employee welfare | 43 |
| -018 | 123 | Manager, personnel | 43 |
| 166.167-014 | 143 | Director of placement | 30, 43, 129 |
| -018 | 123 | Manager, benefits | 43 |
| -022 | 143 | Manager, compensation | 43 |
| -026 | 123 | Manager, education and training | 43 |
| -030 | 123 | Manager, employment | 43 |
| -034 | 143 | Manager, labor relations | 43 |
| 166.227-010 | 239 | Training representative | 43 |
| 166.267-010 | 143 | Employment interviewer | 129 |
| -018 | 143 | Job analyst | 43 |
| -030 | 137 | Retirement officer | 43 |
| 168.167-010 | 5132 | Customs patrol officer | 36 |
| -022 | 1473 | Immigration inspector | 36 |
| -026 | 1473 | Inspector, boiler | 36 |
| -030 | 1472 | Inspector, building | 32 |
| -034 | 1472 | Inspector, electrical | 32 |
| -038 | 1472 | Inspector, elevators | 32 |
| -042 | 1473 | Inspector, health care facilities | 36 |
| -046 | 1472 | Inspector, heating and refrigeration | 32 |
| -050 | 1472 | Inspector, plumbing | 32 |
| -054 | 1419 | Manager, credit and collection | 33 |
| -062 | 1473 | Occupational-safety-and-health inspector | 36 |
| -074 | 1473 | Reviewing officer, driver's license | 36 |
| -078 | 1473 | Safety inspector | 41 |
| 168.264-010 | 1473 | Inspector, air-carrier | 36 |
| -014 | 1473 | Safety inspector | 41 |
| 168.267-014 | 1473 | Claim examiner | 260 |
| -018 | 1473 | Customs import specialist | 36 |
| -022 | 1473 | Customs inspector | 36 |
| -042 | 1473 | Food and drug inspector | 36 |
| -046 | 1473 | Inspector, furniture and bedding | 36 |
| -050 | 1473 | Inspector, government property | 36 |
| -054 | 1473 | Inspector, industrial waste | 36 |
| -058 | 1473 | Inspector, motor vehicles | 36 |
| -062 | 1473 | Investigator | 36 |
| -066 | 1473 | License inspector | 36 |
| -074 | 1473 | Mine inspector | 36, 41 |
| -078 | 1473 | Mortician investigator | 36 |
| 168.287-010 | 1473 | Inspector, agricultural commodities | 36 |
| -014 | 1473 | Inspector, quality assurance | 36 |
| -018 | 1473 | Inspector, railroad | 36 |
| 168.387-010 | 1473 | Opener-verifier-packer, customs | 36 |
| 169.167-010 | 149 | Administrative assistant | 28 |
| -058 | 1414 | Underwriter | 22,48 |
| 169.207-010 | 143 | Conciliator | 43 |
| 169.267-018 | 1419 | Financial aid counselor | 30 |
| -026 | 24 | Supervisor, special services | 30 |
| 169.284-010 | 1473 | Admeasurer | 36 |
| 180.117-010 through .167 | 1320, 5522-5, 5611 | Agricultural occupations | 313 |
| 185.167-034 | 124 | Manager, merchandise | 27 |
| -038 | | Manager, parts | 237 |
| 186.117-026 | 1419 | Factorer | 25 |
| -038 | 122 | Manager, financial institution | 25 |
| -050 | 1419 | Negotiator, letter of credit | 25 |
| -054 | 121 | President, financial institution | 25 |
| -058 | 1353 | Real-estate agent | 247 |
| -070 | 122 | Treasurer, financial institution | 25 |
| -074 | 1419 | Trust officer | 25 |
| -078 | 122 | Vice president, financial institution | 25 |
| 186.137-010 | 4519 | Supervisor, safety deposit | 25 |
| 186.167-014 | 1419 | Foreign-exchange trader | 25 |
| -050 | 1419 | Operations officer | 25 |
| -054 | 122 | Reserve officer | 25 |
| -058 | 1419 | Securities trader II | 25 |
| 186.267-018 | 1415 | Loan officer | 25 |
| 187.117-010 | 121 | Administrator, hospital | 34 |
| -018 | 121 | Director, institution | 34 |
| -038 | 1351 | Manager, hotel or motel | 38 |
| -050 | 1132 | Public health service officer | 34 |
| 187.137-010 | 1352 | Recreation supervisor | 121 |
| 187.161-010 | 1351 | Executive chef | 291 |
| 187.167-034 | 1359 | Director, nurses' registry | 34 |
| -078 | 1351 | Manager, convention | 38 |
| -090 | 1359 | Manager, dental laboratory | 34 |
| -110 | 1351 | Manager, front office | 38 |
| -122 | 1351 | Manager, hotel recreational facilities | 38 |
| -126 | 1351 | Manager, liquor establishment | 38 |
| 188.117-082 | 1134 | Director, medical facilities section | 34 |
| -114 | 112 | Manager, city | 28 |
| 189.167-030 | 137 | Program manager | 28 |
| 191.167-014 | 149 | Claim agent | 260 |
| 193.162-018 | 392 | Air-traffic-control specialist, tower | 219 |
| 193.167-014 | 393 | Field supervisor, broadcast | 221 |
| 193.262-018 | 393 | Field engineer | 221 |
| -022 | 393 | Radio officer | 448 |
| -038 | 393 | Transmitter operator | 221 |
| 194.262-010 | 393 | Audio operator | 221 |
| -018 | 3719 | Sound mixer | 221 |
| 194.282-010 | 393 | Video operator | 221 |
| 194.362-010 | 3719 | Recording engineer | 221 |
| -014 | 3719 | Rerecording mixer | 221 |
| -018 | 393 | Telecine operator | 221 |
| 194.382-014 | 3719 | Tape transferrer | 221 |
| 195.107 | 2032 | Social workers | 119 |
| 195.137-010 | 2032 | Casework supervisor | 119 |
| 195.164-010 | 2032 | Group worker | 119 |
| 195.167-010 | 2032 | Community organization worker | 119 |
| 195.167-014 | 2032 | Community-relations-and-services advisor, public housing | 119 |
| -018 | 1352 | Camp director | 121 |
| -030 | 2032 | Parole officer | 119 |
| -034 | 2032 | Probation officer | 119 |
| 195.227-014 | 2033 | Recreation leader | 121 |
| 195.267-014 | 2032 | Human relations or drug and alcohol counselor | 119 |
| 196.167-010 | 825 | Chief pilot | 445 |
| 196.223 | 825 | Airplane pilots | 445 |
| 196.263-010 | 825 | Airplane pilot | 445 |
| -014 | 825 | Airplane pilot, commercial | 445 |
| -018 | 825 | Airplane pilot, photogrammetry | 445 |
| -022 | 825 | Check pilot | 445 |
| -030 | 825 | Executive pilot | 445 |
| -034 | 825 | Facilities-flight-check pilot | 445 |
| -042 | 825 | Test pilot | 445 |
| 197.130-010 | 8244 | Engineer | 448 |
| 197.133-022 | 8241 | Mate, ship | 448 |
| 197.167-010 | 8241 | Master, ship | 447 |
| -014 | 149 | Purser | 448 |
| 199.167-014 | 192 | Urban planner | 117 |
| 201, 202 | 4513, 4622, 4633 | Secretaries and stenographers | 270 |
| 203 | (1) | Typist | 276 |
| 203.582-022 | 4793 | Data typist | 263 |
| -026 | 4793 | Data coder operator | 263 |
| -030 | 4793 | Keypunch operator | 263, 398 |
| -046 | 4793 | Photocomposition-keyboard operator | 263, 398 |
| -070 | 4793 | Verifier operator | 263 |
| 205.362-026 | 4642 | New-accounts tellers | 258 |
| 205.367-018 | 4782 | Claims clerk | 260 |
| 206.387-030 | 4696 | Tape librarian | 263 |
| 208.685-030 | 4613 | Sorting-machine operator | 256 |
| 209.387-026 | 4696 | Library clerk | 229 |
| 209.687-022 | 4699 | Sorter | 256 |

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Federal Reserve Bank of St. Louis

| D.O.T. Number | SOC Code | D.O.T. Title | Page |
|---|---|---|---|
| 210.382-014 | 4712 | Bookkeeper I | 256 |
| -018 | 4712 | Bookkeeper II | 256 |
| -022 | 4718 | Bookkeeping-machine operator I | 256 |
| -026 | 4718 | Bookkeeping-machine operator II | 256 |
| -058 | 4712 | Reconcilement clerk | 256 |
| 211.132-010 | 4529 | Teller, head | 258 |
| 211.362-010 | 4364 | Cashier I | 240 |
| -014 | 4364 | Foreign banknote teller-trader | 258 |
| -018 | 4791 | Teller | 258 |
| -022 | 4791 | Teller, collection and exchange | 258 |
| -026 | 4791 | Teller, note | 258 |
| 211.367 through .582 | 4364 | Cashiers | 240 |
| 213.132-010 | 4512 | Supervisor computer operators | 263 |
| -014 | 4512 | Supervisor, machine recorders unit | 263 |
| 213.362-010 | 4613 | Computer operators | 263 |
| 213.382-010 | 4613 | Computer-peripheral-equipment operator | 263 |
| 213.685-010 | 4613 | Auxiliary-equipment operator, data processing | 263 |
| 216.362-014 | 4712 | Collection clerk | 256 |
| -026 | 4712 | Mortgage-accounting clerk | 256 |
| 216.382-038 | 4712 | Interest clerk | 256 |
| 217.382 | 4718, 4729 | Bank clerk | 256 |
| 219.362-062 | 4699 | Trust-securities clerk | 256 |
| 219.367-026 | 375 | Programmer, detail | 230 |
| 219.462-010 | 4791 | Coupon clerk | 258 |
| 219.467-010 | 4795 | Grading clerk | 273 |
| 222.587-014 | 4753 | Braille-and-talking-books clerk | 229 |
| 230.363-010 | 4743 | Rural-mail carrier | 267 |
| 230.367-010 | 4743 | Mail carrier | 267 |
| 235.222-010 | 239 | Private-branch-exchange service advisor | 274 |
| 235.462-010 | 4732 | Central-office operator | 274 |
| 235.562-014 | 4732 | Switchboard operator, police district | 274 |
| 235.662-014 | 4732 | Communication-center operator | 274 |
| -018 | 4732 | Directory-assistance operator | 274 |
| -022 | 4732 | Telephone operator | 274 |
| -026 | 4739 | Telephone-answering-service operator | 274 |
| 237.367-038 | 4645 | Receptionist | 269 |
| 238.137-010 | 4514 | Manager, reservations | 38 |
| 238.362-010 | 4643 | Hotel clerk | 265 |
| 238.367-010 | 4644 | Gate agent | 255 |
| -018 | 4644 | Reservations agent | 255 |
| -026 | 4644 | Ticket agent | 255 |
| -030 | 4644 | Travel clerk | 265 |
| 239.367-026 | 4739 | Service observer | 274 |
| 241.217-010 | 4782 | Claim adjuster | 260 |
| 241.267-018 | 4782 | Claim examiner | 260 |
| 241.357-010 | 4786 | Collection clerk | 262 |
| 241.362-010 | 4782 | Claims clerk | 260 |
| 241.367-010 | 4786 | Collector | 262 |
| -022 | 4786 | Repossessor | 262 |
| -026 | 4783 | Skip tracer | 262 |
| 243.367-014 | 4742 | Post-office clerk | 268 |
| 245.362-010 | 4794 | Medical record clerk | 186 |
| 247.137-010 | 4525 | Supervisor, advertising-dispatch clerks | 235 |
| 247.382-010 | 4699 | Media clerk | 235, 236 |
| 247.387-010 | 4756 | Advertising clerk | 235 |
| 249.365-010 | 4694 | Registration clerk | 229 |
| 249.367-046 | 4694 | Library assistant | 229 |
| -074 | 4795 | Teacher aide II | 273 |
| 249.382-010 | 4799 | Mortgage clerk | 256 |
| 249.467-010 | 4364 | Information clerk-cashier | 240 |
| 249.687-014 | 4694 | Page (library) runner | 229 |
| 250.157-010 | 4123 | Superintendent, sales | 247 |
| 250.257-010 | 4122 | Sales agent, insurance | 235, 242 |
| 250.357-014 | 4123 | Leasing agent, residence | 247 |
| -018 | 4123 | Sales agent, real estate | 247 |
| 251.157-010 | 4124 | Sales agent, securities | 250 |
| 252.157-010 | 4369 | Travel agent | 235, 252 |
| 254.357-014 | 4153 | Sales representative, advertising | 235, 236 |
| 259.357-018 | 4153 | Sales representative, radio and television time | 235, 236 |
| 260 through 290 | (2) | Retail trade sales workers, manufacturers' sales workers, wholesale trade sales workers | 249, 243, 253 |
| 273.353-010 | 4342 | Salesperson, automobiles | 239 |
| 279.357-062 | 4367 | Salesperson, parts | 237 |
| 297.667-014 | 445 | Model | 245 |
| 298.081-010 | 322 | Displayer, merchandise | 201, 203 |
| 298.381-010 | 322 | Decorator | 201, 203, 204 |
| 299.474-010 | 449 | Optician, dispensing II | 402 |
| 311.137-010 | 5211 | Counter supervisor | 293 |
| -014 | 5211 | Waiter/waitress, banquet, head | 295 |
| -018 | 5211 | Waiter/waitress, captain | 295 |
| -022 | 5211 | Waiter/waitress, head | 295 |
| 311.477-014 | 5216 | Counter attendant, lunchroom or coffee shop | 293 |
| -018 | 5213 | Waiter/waitress, bar | 295 |
| -022 | 5213 | Waiter/waitress, dining car | 295 |
| -026 | 5213 | Waiter/waitress, formal | 295 |
| -030 | 5213 | Waiter/waitress, informal | 295 |
| -034 | 5216 | Waiter/waitress, room service | 295 |
| -038 | 5216 | Waiter/waitress, take out | 295 |
| 311.674-010 | 5216 | Canteen operator | 293 |
| -018 | 5213 | Waiter/waitress, buffet | 295 |
| 311.677-010 | 5218 | Cafeteria attendant | 296 |
| -014 | 5216 | Counter attendant, cafeteria | 293 |
| -018 | 5218 | Dining room attendant | 296 |
| 312.474 and .477 | 5212 | Bartenders | 290 |
| 312.687-010 | 5218 | Bartender helper | 290 |
| 313 through 315 | 5211, 5214-5, 5219 | Cooks and chefs | 291, 450 |
| 316 | 5217 | Meatcutters | 294 |
| 318.687-010 | 5219 | Kitchen helper | 296 |
| -014 | 5219 | Scullion | 450 |
| 319.474-010 | 5216 | Fountain server | 293 |
| 321 | 5214 | Hotel housekeepers and assistants | 305 |
| 323.137-010 | 5241 | Supervisor, housecleaner | 305 |
| 324.137 | 5251 | Bellhops and bell captains | 308 |
| 324.477-010 | 5262 | Porter, baggage | 308 |
| 324.677-010 | 5262 | Bellhop | 308 |
| 330.371-010 | 5252 | Barber | 307 |
| -014 | 5252 | Barber apprentice | 307 |
| 332.271-018 | 5252 | Hair stylist | 309 |
| 331 and 332 | 5252 | Cosmetologists | 309 |
| 339.371-014 | 5253 | Scalp-treatment operator | 309 |
| 350.137-014 | 5211 | Steward/stewardess, chief, cargo vessel | 450 |
| 350.677-010 | 5213 | Mess attendant | 450 |
| 352.167-010 | 5269 | Director, social | 121 |
| 352.367-010 | 5257 | Airplane-flight attendant | 311 |
| 365.361-014 | 6854 | Shoe repairer | 416 |
| 372.137-010 | 5112 | Correction officer, head | 280 |
| 372.267 through .367-010 | 5132, 5144 | Guards | 284 |
| 372.367-014 | 5133 | Jailer | 280 |
| 372.563 | 5144 | Armored car guard and driver | 284 |
| 372.567-010 | 5144 | Armored car guard | 284 |
| 372.667-010 | 5144 | Airline security representative | 284 |
| -014 | 5144 | Bodyguard | 284 |
| -018 | 5133 | Correction officer | 280 |
| -030 | 5144 | Gate tender | 284 |
| -034 | 5144 | Guard, security | 284 |
| -038 | 5144 | Merchant patroller | 284 |
| 372.677-010 | 5133 | Patrol conductor | 280 |
| 373 | 1131, 5111, 5122-3 | Firefighters | 282 |
| 373.167-018 | 5119 | Fire marshal | 41 |
| 373.367-010 | 5122 | Fire inspector | 41 |
| 375.133-010 | 5112 | Police sergeant | 286, 287 |


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Federal Reserve Bank of St. Louis

| D.O.T. Number | SOC Code | D.O.T. Title | Page |
|---|---|---|---|
| 375.137-010 | 5142 | Commander, identification and records | 286, 287 |
| -014 | 5112 | Desk officer | 286, 287 |
| -018 | 4511 | Police lieutenant, community relations | 286 |
| -022 | 4511 | Secretary of police | 287 |
| -026 | 5112 | Traffic sergeant | 286, 287 |
| 375.163-010 | 5112 | Commanding officer, motorized squad | 286, 287 |
| -014 | 5132 | Pilot, highway patrol | 286, 287 |
| 375.167-010 | 5112 | Commanding officer, homicide squad | 286, 287 |
| -014 | 5112 | Commanding officer, investigation division | 286, 287 |
| -018 | 137 | Commanding officer, motor equipment | 286, 287 |
| -022 | 5112 | Detective chief | 286, 287 |
| -030 | 5112 | Launch commander, harbor police | 286 |
| -034 | 5112 | Police captain, precinct | 286, 287 |
| -038 | 5112 | Police lieutenant, patrol | 286, 287 |
| -042 | 5132 | Special agent | 282 |
| -046 | 5112 | Traffic lieutenant | 286 |
| 375.263-010 | 5132 | Accident-prevention-squad police officer | 286, 287 |
| -014 | 5132 | Police officer I | 286 |
| -018 | 5132 | State-highway police officer | 287 |
| 375.267-010 through 375.267-026 | 5132 | Police officers | 286, 287 |
| 375.267-030 | 5132 | Police inspector II | 286 |
| 375.367 through 375.587 | 5112, 5134 | Police officers | 286 |
| 375.367-010 | 5133 | Police officer II | 280 |
| 375.384-010 | 5132 | Police officer, identification and records | 286, 287 |
| 376.667-018 | 5144 | Patroller | 284 |
| 377.117 through 377.264 | 5012, 5122, 5124, 5133 | Police officers | 286 |
| 377.667-018 | 5134 | Deputy sheriff, civil division | 286 |
| 379.364-010 | 782 | Automobile tester | 36 |
| 401 through 405, 407 through 429 | ([3]) | Agriculture occupations | 313 |
| 452 | 5122-3, 5720 | Forestry technicians | 318 |
| 452.364-014 | 5123 | Smoke jumper | 282 |
| 452.687-014 | 5123 | Forest-fire fighter | 282 |
| 459.387-010 | 579 | Cruiser | 318 |
| 503.685-030 | 7549 | Metal-cleaner, immersion | 425 |
| 503.687.010 | 875 | Sandblaster | 425 |
| 504.682-010 | 7544 | Annealer | 425 |
| -018 | 7544 | Heat treater II | 425 |
| 518.361-010 | 6861 | Molder | 409 |
| 518.381-014 | 6861 | Coremaker | 399 |
| 518.682-010 | 7542 | Machine molder | 409 |
| 518.685-014 | 7542 | Coremaker, machine I | 399 |
| -018 | 7542 | Coremaker, machine II | 399 |
| -022 | 7542 | Coremaker, machine III | 399 |
| 542.562-010 | 7675 | Furnace operator | 423 |
| 553.682-010 | 7675 | Black-ash burner operator | 423 |
| -022 | 7675 | Reduction-furnace operator | 423 |
| 553.685-030 | 7675 | Calcine furnace | 423 |
| -086 | 7675 | Pigment furnace tender | 423 |
| -090 | 7675 | Rabble-furnace tender | 423 |
| -094 | 7675 | Rotary-furnace tender | 423 |
| 558.382-014 | 7676 | Burner operator | 423 |
| 558.482-010 | 7675 | Furnace operator | 423 |
| 558.685-054 | 7675 | Red-lead burner | 423 |
| 559.585-022 | 7676 | Vacuum-pan operator | 423 |
| 559.662-010 | 7675 | Acid maker | 423 |
| 563.682-010 | 7675 | Charcoal burner, beehive kiln | 423 |
| 572.360-010 | 6881 | Furnace-combustion analyst | 423 |
| 573.362-010 | 7675 | Dry-kiln operator | 423 |
| 600.260-018 | 7329 | Model maker, firearms | 392 |
| 600.280-010 | 6813 | Instrument maker | 405 |
| -022 | 6813 | Machinist | 392 |
| -026 | 6813 | Machinist apprentice | 392 |
| -030 | 6813 | Machinist apprentice, automotive | 392 |
| -034 | 6813 | Machinist, automotive | 392 |
| -038 | 6813 | Machinist, experimental | 392 |
| -042 | 6813 | Maintenance machinist | 392 |
| -046 | 6817 | Patternmaker apprentice, metal | 412 |
| -050 | 6817 | Patternmaker, metal | 412 |
| 600.281-010 | 613 | Fluid-power mechanic | 392 |
| -018 | 6881 | Lay-out worker | 392 |
| 600.360-010 | 6813 | Machine try-out setter | 429 |
| 600.380-010 | 7329 | Fixture maker | 429 |
| -014 | 7329 | Job setter | 429 |
| -022 | 7329 | Machine setter | 429 |
| 601.280 except -022 | 6811 | Tool-and-die maker | 417 |
| 601.280-022 | 6811 | Die sinker | 425 |
| 601.281-010 | 6811 | Die maker, bench, stamping | 417 |
| -014 | 6811 | Die-try-out worker, stamping | 417 |
| -026 | 6811 | Tool maker, bench | 417 |
| 601.380-010 | 6829 | Carbide operator | 417 |
| 601.381-010 | 6811 | Die finisher | 417 |
| -014 | 6811 | Die maker | 417 |
| -022 | 6811 | Die maker apprentice | 417 |
| -026 | 6811 | Plastic tool maker | 417 |
| -030 | 6811 | Plastic fixture builder | 417 |
| -034 | 6811 | Saw maker | 417 |
| 602 | 75, 76 | Machine tool operators | 427 |
| 603 except .280-034, .360-010 and .380-010 | 75, 76 | Machine tool operator | 427 |
| 603.280-034 | 7322 | Job setter | 429 |
| 603.360-010 | 7322 | Buffing-line set-up worker | 429 |
| 603.380-010 | 7322 | Grinder machine setter | 429 |
| 604 except .360-010 | 75, 76 | Machine tool operator | 427 |
| 604.360-010 | 7312 | Setter, automatic-spinning lathe | 429 |
| 605 | 75, 76 | Machine tool operator | 427 |
| 606 | 75, 76 | Machine tool operator | 427 |
| 609.280-010 | 7339 | Trim-machine adjuster | 429 |
| 609.380-014 | 7312 | Threader-machine setter | 429 |
| 610.462-010 | 7319 | Drop-hammer operator | 425 |
| 611.462-010 | 7319 | Upsetter | 425 |
| 611.482-010 | 7319 | Forging-press operator I | 425 |
| 611.685-010 | 7319 | Forging-press operator II | 425 |
| 612.261-010 | 6881 | Inspector | 425 |
| 612.360-010 | 7319 | Die setter | 429 |
| 612.361-010 | 6829 | Heavy forger | 425 |
| 615.280-010 | 7314 | Slitter service and setter | 429 |
| 615.380-010 | 7314 | Shear setter | 429 |
| 615.685-030 | 7514 | Punch-press operator II | 425 |
| 616.260-018 | 7339 | Spring coil machine setter | 429 |
| 616.360-022 | 7329 | Machine setter | 429 |
| 616.380.010 | 7339 | Four-slide-machine setter | 429 |
| 619.260-008 | 7339 | Ornamental metal worker | 383 |
| -010 | 7339 | Ornamental metal worker apprentice | 383 |
| 619.380-014 | 7314 | Punch press setter | 429 |
| -018 | 7339 | Spring repairer, hand | 324, 328 |
| 619.682-022 | 7544 | Heater | 425 |
| 620.261-010 | 6111 | Automobile mechanic | 324, 328 |
| -012 | 6111 | Automobile-mechanic apprentice | 324, 328 |
| -014 | 6881 | Automobile tester | 394 |
| -018 | 6881 | Automobile-repair-service estimator | 394 |
| 620.281-010 | 6111 | Air-conditioning mechanic | 324, 328 |
| -026 | 6111 | Brake repairer | 324, 328 |
| -030 | 6881 | Bus inspector | 328 |
| -034 | 6111 | Carburetor machanic | 324, 328 |
| -038 | 6111 | Front-end mechanic | 324, 328 |
| -046 | 6111 | Maintenance mechanic | 324, 328 |
| -062 | 6111 | Transmission mechanic | 324, 328 |
| -066 | 6111 | Tune-up mechanic | 324, 328 |
| -070 | 6111 | Vehicle-fuel-systems converter | 324, 328 |
| 620.364-010 | 6115 | Squeak, rattle, and leak repairer | 324, 328 |

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Federal Reserve Bank of St. Louis

| D.O.T. Number | SOC Code | D.O.T. Title | Page |
|---|---|---|---|
| 620.381.010 | 6111 | Automobile-radiator mechanic | 324, 328 |
| -018 | 6117 | Mechanical unit repairer | 328 |
| -022 | 6111 | Repairer, heavy | 324, 328 |
| 620.584-010 | 8619 | Spring repairer helper, hand | 324, 328 |
| 620.682-010 | 7312 | Brake drum-lathe operator | 324, 328 |
| 620.684-014 | 8632 | Automobile-mechanic helper | 324, 328 |
| -018 | 6111 | Brake adjuster | 324, 328 |
| -022 | 6111 | Clutch rebuilder | 324, 328 |
| -034 | 6111 | Used-car renovator | 323 |
| 621.281-014 | 6116 | Airframe-and-power-plant mechanic | 321 |
| -030 | 6117 | Mine-car repairer | 350 |
| 624.281-010 | 6118 | Farm equipment mechanic | 326 |
| -014 | 6118 | Farm equipment mechanic apprentice | 326 |
| .361-014 | 6118 | Sprinkler-irrigation-equipment mechanic | 326 |
| 624.381 through .684 | 6118, 6812 | Farm equipment mechanics | 326 |
| 625.261-010 | 6881 | Diesel-engine tester | 328 |
| 625.281-010 | 6112 | Diesel mechanic | 328 |
| -014 | 6112 | Diesel-mechanic apprentice | 328 |
| -022 | 6111 | Fuel-injection servicer | 328 |
| 625.361-010 | 6112 | Diesel-engine erector | 328 |
| 625.684-010 | 8632 | Diesel-mechanic helper | 328 |
| 626 | 613 | Industrial machinery repairers | 350 |
| 628.261-010 | 613 | Overhauler | 350 |
| 628.281-010 | 613 | Machine fixer | 350 |
| 628.381-010 | 613 | Card clothier | 350 |
| 628.382-010 | 613 | Flat clothier | 350 |
| 628.484-010 | 613 | Reed repairer | 350 |
| 628.684-018 | 613 | Needle straightener | 350 |
| -026 | 613 | Shuttle fixer | 350 |
| -030 | 613 | Spindle plumber | 350 |
| -034 | 613 | Utility worker, roller shop | 350 |
| 629.280-010 | 613 | Maintenance mechanic | 350 |
| 630.281-038 | 613 | Treatment-plant mechanic | 350 |
| 631.261-014 | 613 | Powerhouse mechanic | 350 |
| 633 | 6000, 6154, 6171, 6174 | Business machine repairers | 346 |
| 637.261-010 | 6156 | Air-conditioning installer-servicer, window unit | 345 |
| -014 | 616 | Environmental-control-system installer-servicer | 345 |
| -018 | 6179 | Gas-appliance servicer | 330, 345 |
| -026 | 616 | Refrigeration mechanic | 345 |
| 637.381-010 | 616 | Evaporative-cooler installer | 345 |
| -014 | 616 | Refrigeration unit repairer | 345 |
| 638.261-014 | 6178 | Machine erector | 351 |
| -022 | 6179 | Pinsetter mechanic, automatic | 355 |
| 638.281-018 | 6178 | Millwright | 351 |
| -022 | 6178 | Millwright apprentice | 351 |
| 639.281-014 | 6179 | Coin-machine-service repairer | 355 |
| 650.582 | 7442, 7642 | Compositor | 398 |
| 653.685-010 | 7649 | Bindery worker | 396 |
| 661.281-022 | 6831 | Patternmaker, wood | 412 |
| 683.684-010 | 613 | Chain repairer | 350 |
| 683.685-014 | 614 | Card changer, Jacquard loom | 350 |
| 692.260-010 | 7322 | Machine setter | 429 |
| 699.687-014 | 875 | Machine cleaner | 450 |
| 700.281-010 | 6822 | Jeweler | 407 |
| -014 | 6822 | Jeweler apprentice | 407 |
| -022 | 6822 | Silversmith | 407 |
| 700.381-030 | 6822 | Locket maker | 407 |
| -042 | 6822 | Ring maker | 407 |
| -046 | 6822 | Sample maker | 407 |
| 705.484-010 | 7758 | Filer, hand, tool | 425 |
| -014 | 7529 | Final finisher, forging dies | 425 |
| 706.381-030 | 6174 | Repairer, typewriter | 346 |
| -046 | 6111 | Wheelwright | 324, 328 |
| 709.687-018 | 8641 | Hot-top-liner helper | 455 |
| 712.281-010 | 6865 | Dental ceramist | 175 |
| 712.381-014 | 6865 | Contourwire specialist, denture | 175 |
| -018 | 6865 | Dental-laboratory technician | 175 |
| -030 | 6865 | Orthodontic technician | 175 |
| 713.361-010 | 6864 | Optician apprentice, dispensing | 402 |
| -014 | 6864 | Optician, dispensing I | 402 |
| 713.681-010 | 6864 | Lens mounter | 410 |
| 713.684-026 | 7759 | Eyeglass-frame truer | 410 |
| -038 | 7522 | Polisher, eyeglass frames | 410 |
| 714.281-018 | 6813 | Machinist, motion picture equipment | 392 |
| 715.281-010 | 6171 | Watch repairer | 358 |
| -014 | 6171 | Watch repairer apprentice | 358 |
| 716.280-008 | 6864 | Optician | 410 |
| -010 | 6864 | Optician apprentice | 410 |
| 716.280-014 | 6864 | Optician | 410 |
| 716.360-010 | 7322 | Sizer, machine | 410 |
| 716.382-010 | 6864 | Lathe operator, contact lens | 410 |
| -018 | 7477 | Precision-lens grinder | 410 |
| -022 | 7477 | Precision-lens grinder apprentice | 410 |
| 716.462-010 | 6864 | Precision-lens centerer and edger | 410 |
| 716.681-018 | 6864 | Lens polisher, hand | 410 |
| 716.682-010 | 7478 | Eyeglass-lens cutter | 410 |
| -014 | 7678 | Precision-lens generator | 410 |
| -018 | 6864 | Precision-lens polisher | 410 |
| 716.685-018 | 7677 | Grinder, hand | 410 |
| -022 | 7677 | Lens-fabricating-Machine tender | 410 |
| 720.281-010 | 6155 | Radio repairer | 343 |
| -014 | 6155 | Tape-recorder repairer | 343 |
| -018 | 6155 | Televison-and-radio repairer | 343 |
| 721.281-010 | 6152 | Automotive-generator-and-starter repairer | 324, 328 |
| -026 | 6152 | Propulsion-motor-and-generator repairer | 328 |
| 722.281-010 | 6151 | Instrument repairer | 331 |
| 723.381-010 | 6156 | Electrical-appliance repairer | 330 |
| -014 | 6156 | Vacuum cleaner repairer | 330 |
| 723.584-010 | 6156 | Appliance repairer | 330 |
| 729.381-018 | 6159 | Street-light repairer | 340 |
| 730.281-038 | 6172 | Piano technician | 353 |
| 730.361-010 | 6172 | Piano tuner | 353 |
| -014 | 6172 | Pipe organ tuner and repairer | 353 |
| 753.684.026 | 6179 | Repairer, boot and shoe | 416 |
| 780.381-018 | 6853 | Furniture-upholsterer | 404 |
| -022 | 6853 | Furniture-upholsterer apprentice | 404 |
| 780.684-122 | 6179 | Upholstery repairer | 404 |
| 788.381-010 | 6854 | Cobbler | 416 |
| 801.361-014 | 6473 | Structural-steel worker | 375 |
| -018 | 6473 | Structural-steel worker apprentice | 375 |
| 801.684-026 | 6473 | Reinforcing-metal worker | 375 |
| 804.281-010 | 6824 | Sheet-metal worker | 383 |
| -014 | 6824 | Sheet-metal worker apprentice | 383 |
| 805.261 through .381 | 6814 | Boilermaking occupations | 395 |
| 806.684-010 | 772 | Assembler, automobile | 433 |
| 806.684-118 | 772 | Repairer, general | 324, 328 |
| 807.281-010 | 6115 | Truck-body builder | 323 |
| 807.381-010 | 6115 | Automobile-body repairer | 323 |
| -022 | 6115 | Service mechanic | 328 |
| .664-010 | 6711 | Muffler installer | 324 |
| 807.684-010 | 6115 | Automobile-bumper straightener | 323 |
| 809.281-010 | 6821 | Lay-out worker I | 395 |
| 810 through 819.281-014 | (4) | Welders | 436 |
| 819.281-022 through .686-010 | 7533, 7714, 862, 8725 | Welders | 436 |
| 819.687-014 | 862 | Welder helper | 436 |
| 820.261-010 | 6153 | Electrician apprentice, powerhouse | 340 |
| -014 | 6153 | Electrician, powerhouse | 340 |
| -018 | 6153 | Electrician, substation | 340 |
| 820.381-010 | 6152 | Battery maintainer, large emergency storage | 340 |


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Federal Reserve Bank of St. Louis

| D.O.T. Number | SOC Code | D.O.T. Title | Page |
|---|---|---|---|
| 821.261-014 | 6433 | Line maintainer | 338, 369 |
| 821.361-010 | 6433 | Cable installer-repairer | 338 |
| -018 | 6433 | Line erector | 369 |
| -030 | 6433 | Line erector apprentice | 369 |
| -038 | 6433 | Tower erector | 369 |
| 821.367-014 | 782 | Safety inspector | 41 |
| 821.381-014 | 6881 | Voltage tester | 340 |
| -014 | 8643 | Tower erector helper | 369 |
| 822.261-010 | 6151 | Electrician, office | 331, 340 |
| -018 | 6881 | Maintenance inspector | 340 |
| -022 | 6158 | Station installer-and-repairer | 341 |
| 822.281-014 | 6151 | Central-office repairer | 331 |
| -018 | 6158 | Maintenance mechanic, telephone | 341 |
| -022 | 6151 | Private-branch-exchange repairer | 341 |
| -030 | 6151 | Technician, plant and maintenance | 221 |
| -034 | 6151 | Technician, submarine cable equipment | 331 |
| 822.361-010 | 6151 | Cable tester | 338 |
| -014 | 6151 | Central-office installer | 333 |
| -026 | 6151 | Transmission tester | 331 |
| -030 | 6881 | Trouble locator, test desk | 331 |
| 822.381-014 | 6157 | Line installer-repairer | 338 |
| -018 | 6151 | Private-branch-exchange installer | 341 |
| 822.684-010 | 772 | Frame wirer | 331 |
| 824.261-010 | 6432 | Electrician | 369 |
| -014 | 6432 | Electrician apprentice | 369 |
| 824.281-010 | 6432 | Airport electrician | 340 |
| -014 | 782 | Electric distribution checker | 369 |
| -018 | 6432 | Neon-sign servicer | 336 |
| 824.381-010 | 6432 | Street-light servicer | 340 |
| 824.681-010 | 6432 | Electrician | 340, 369 |
| 824.683-010 | 782 | Night patrol inspector | 336 |
| 824.684-010 | 772 | Neon tube pumper | 336 |
| 825.281-010 | 6159 | Electrical repairer | 340 |
| -014 | 6152 | Electrician | 340, 450 |
| -018 | 6159 | Electrician, airplane | 340 |
| -022 | 6159 | Electrician, automotive | 324, 328, 340 |
| -026 | 6159 | Electrician, locomotive | 340 |
| -030 | 6176 | Elevator repairer | 340, 348, 369 |
| -034 | 6176 | Elevator-repairer apprentice | 340, 369 |
| 825.361-010 | 6176 | Elevator constructor | 348 |
| 825.381-010 | 6151 | Aircraft mechanic electrical and radio | 340 |
| -014 | 6151 | Top-lift and automatic window repairer | 324, 340 |
| -018 | 6159 | Controller repairer and tester | 340 |
| -022 | 6867 | Electrical and radio mock-up mechanic | 340 |
| -026 | 6881 | Electrical inspector | 340 |
| -030 | 6432 | Electrician, marine | 340 |
| -034 | 6432 | Electrician apprentice, marine | 340 |
| -038 | 6159 | Third-rail installer | 340 |
| 825.664-010 | 8637 | Elevator constructor helper | 348 |
| 827.261-010 | 6156 | Electrical-appliance servicer | 330 |
| -014 | 6156 | Electrical-appliance service apprentice | 330 |
| 827.361-014 | 616 | Refrigeration mechanic | 345 |
| 827.464-010 | 6156 | Air conditioning installer | 330, 345 |
| 827.584-010 | 772 | Electrical-appliance repairer | 330 |
| 827.661-010 | 6156 | Household-appliance installer | 330 |
| 828.261-010 | 6155 | Electronic-organ technician | 353 |
| -014 | 6153 | Field engineer | 335 |
| 828.281-010 | 6153 | Electronics mechanic | 335 |
| 828.381-010 | 6159 | Equipment installer | 340 |
| 829.281-010 | 6175 | Automatic-door mechanic | 369 |
| -014 | 6153 | Electrical repairer | 340, 369 |
| 829.361-010 | 6157 | Cable splicer | 338, 340, 369 |
| -014 | 6157 | Cable-splicer apprentice | 338, 340, 369 |
| 829.667-010 | 8635 | Cable-splicer helper | 338 |
| 829.684-022 | 8643 | Electrician helper | 455 |
| 840.381-010 | 6442 | Painter | 377 |
| -014 | 6442 | Painter apprentice, shipyard | 377 |
| -018 | 6442 | Painter, shipyard | 377 |
| 840.681-010 | 6442 | Painter, stage setting | 377 |
| 841.381-010 | 6443 | Paperhanger | 377 |
| 842.361-018 | 6444 | Plasterer | 379 |
| -022 | 6444 | Plasterer apprentice | 379 |
| -026 | 6444 | Plasterer, molding | 379 |
| 842.381-010 | 6424 | Dry-wall applicator | 368 |
| -014 | 6444 | Stucco mason | 379 |
| 842.644-010 | 6424 | Taper | 368 |
| 842.681-010 | 6424 | Dry-wall applicator | 368 |
| 844.364-010 | 6463 | Cement mason | 366 |
| -014 | 6463 | Cement mason apprentice | 366 |
| 844.461-010 | 6463 | Concrete-stone finisher | 366 |
| 844.684-010 | 6463 | Concrete rubber | 366 |
| 845.381-010 | 7669 | Painter apprentice, automotive | 434 |
| -014 | 7669 | Painter, transportation equipment | 434 |
| 845.681-010 | 6442 | Railroad car letterer | 377 |
| 850.662-010 | 6474 | Horizontal-earth-boring-machine operator | 452 |
| -014 | 7678 | Rock-drill operator | 452 |
| 850.663-010 | 8316 | Dredge operator | 455 |
| -014 | 8317 | Elevating-grader operator | 452 |
| -018 | 8245 | Lock tender | 452 |
| -022 | 8317 | Motor-grader operator | 452 |
| -026 | 8316 | Stripping-shovel operator | 387 |
| 850.683-010 | 8317 | Bulldozer operator I | 387, 452 |
| -018 | 8316 | Dragline operator | 452 |
| -022 | 8317 | Form-grader operator | 452 |
| -026 | 8316 | Mucking-machine operator | 452 |
| -030 | 8316 | Power-shovel operator | 387, 452 |
| -034 | 6474 | Rock-drill operator I | 452 |
| -038 | 8317 | Scraper operator | 452 |
| -042 | 8316 | Tower-excavator operator | 452 |
| -046 | 8317 | Utility-tractor operator | 452 |
| 851.663-010 | 8316 | Septic-tank installer | 452 |
| 853.663-010 | 6466 | Asphalt-paving-machine operator | 452 |
| -014 | 6466 | Concrete-paving-machine operator | 452 |
| -022 | 6466 | Stone spreader operator | 452 |
| 853.683 | 4666, 6466, 8317 | Operating engineers | 387 |
| 853.685-010 | 6466 | Asphalt-heater tender | 455 |
| 859.362-010 | 6474 | Well-drill operator | 452 |
| .682-010 | 6474 | Earth-boring-machine operator | 452 |
| -014 | 6474 | Foundation-drill operator | 452 |
| -018 | 6476 | Pile-driver operator | 452 |
| 859.683 | 8312, 6466 | Operating engineers | 452 |
| 860.281 through 860.381-054 | 6422 | Carpenters | 364 |
| 860.664-014 | 8642 | Joiner helper | 455 |
| 861.361-010 | 6413 | Composition-stone applicator | 363 |
| -014 | 6413 | Monument setter | 363 |
| 861.381-010 | 6412 | Acid-tank liner | 363 |
| -014 | 6412 | Bricklayer | 363 |
| -018 | 6412 | Bricklayer | 363 |
| -022 | 6412 | Bricklayer apprentice | 363 |
| -026 | 6412 | Bricklayer, firebrick and refractory tile | 363 |
| -030 | 6413 | Marble setter | 363 |
| -038 | 6413 | Stonemason | 363 |
| -042 | 6413 | Stonemason apprentice | 363 |
| -046 | 6463 | Terrazzo worker | 366 |
| -050 | 6463 | Terrazzo-worker apprentice | 366 |
| -054 | 6414 | Tile setter | 385 |
| -058 | 6414 | Tile setter apprentice | 385 |
| -062 | 6414 | Tile-conduit layer | 385 |
| 861.684-010 | 6412 | Cupola patcher | 363 |
| -014 | 6412 | Patcher | 363 |
| -018 | 6414 | Tile setter | 385 |


Digitized for FRASER
http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis

| D.O.T. Number | SOC Code | D.O.T. Title | Page |
|---|---|---|---|
| 861.687-010 | 8641 | Bricklayer helper, firebrick and refractory tile | 455 |
| 862.261-010 | 645 | Pipe fitter | 380 |
| 862.281-010 | 645 | Coppersmith | 380 |
| -014 | 645 | Coppersmith apprentice | 380 |
| -018 | 645 | Oil burner servicer and installer | 345 |
| 862.361-010 | 645 | Furnace installer | 345 |
| -014 | 645 | Gas-main fitter | 380 |
| -018 | 645 | Pipe fitter, diesel engine I | 380 |
| 862.381-010 | 645 | Aircraft mechanic, plumbing and hydraulics | 380 |
| -014 | 645 | Industrial-gas fitter | 380 |
| -018 | 645 | Pipe fitter | 380 |
| -022 | 645 | Pipe fitter diesel engine II | 380 |
| -026 | 645 | Pipe fitter apprentice | 380 |
| -030 | 645 | Plumber | 380 |
| -034 | 645 | Plumber apprentice | 380 |
| 862.681-010 | 645 | Plumber | 380 |
| 862.682-010 | 645 | Pipe cutter | 380 |
| 862.684-014 | 871 | Laborer, construction or leak | 455 |
| -022 | 8645 | Pipe-fitter helper | 455 |
| -034 | 645 | Water softener servicer and installer | 380 |
| 863.364-010 | 6465 | Insulation worker apprentice | 374 |
| 863.381 thru 863.664 | 6465 | Insulation workers | 374 |
| 863.684-010 | 6465 | Composition-weatherboard applier | 364 |
| 863.685-010 | 6465 | Insulation power unit tender | 374 |
| 864.381-010 | 6462 | Carpet layer | 371 |
| 864.481-010 | 6462 | Floor layer | 371 |
| 864.687-010 | 8648 | Carpet-layer helper | 371 |
| 865.381-010 | 6464 | Glazier | 372 |
| -014 | 6464 | Glazier apprentice | 372 |
| 866.381-010 | 6468 | Roofer | 382 |
| -014 | 6468 | Roofer apprentice | 382 |
| .684-010 | 6468 | Roofer applicator | 382 |
| 869.281-010 | 6167 | Furnace installer and repairer, hot air | 345 |
| 869.361-018 | 6422 | Sign erector and repairer | 336, 364 |
| 869.381-010 | 6422 | House repairer | 364 |
| -034 | 6422 | Timber framer | 364 |
| 869.664-014 | 6479 | Construction worker I | 455 |
| **869.683-014** | 8314 | Rigger | 375 |
| 869.684-022 | 6479 | Fence erector | 455 |
| -050 | 6424 | Sheetrock applicator | 368 |
| 869.685-010 | 7675 | Kettle tender | 455 |
| 869.687-026 | 871 | Construction worker II | 455 |
| 900.683-010 | 8213 | Concrete-mixing-truck driver | 442 |
| 902.683-010 | 8213 | Dump-truck driver | 442 |
| 903.683-010 | 8213 | Explosives-truck driver | 442, 443 |
| -014 | 8213 | Powder-truck driver | 442, 443 |
| -018 | 8213 | Tank-truck driver | 442, 443 |
| 904.383-010 | 8212 | Tractor-trailer-truck driver | 443 |
| 904.683-010 | 8212 | Log-truck driver | 443 |
| 905.483-010 | 8213 | Milk driver | 443 |
| 905.663-010 | 8213 | Garbage collector driver | 442 |
| -014 | 8213 | Truck driver, heavy | 442, 443 |
| -018 | 8212 | Van driver | 442 |
| 905.683-010 | 8213 | Water-truck driver II | 442 |
| 906 | 8214 | Local truckdrivers | 442 |
| 909.127-010 | 1342 | Safety coordinator | 41 |
| 911.131-010 | 71 | Boatswain | 450 |
| 911.364-010 | 8243 | Able seaman | 450 |
| 911.584-010 | 8244 | Marine oiler | 450 |
| 911.687-022 | 8243 | Deckhand | 450 |
| -030 | 8243 | Ordinary seaman | 450 |
| 913.463-010 | 8215 | Bus driver | 439,440 |
| 921.260-010 | 6177 | Rigger | 375 |
| 921.663-014 | 8315 | Cherry picker operator | 452 |
| -030 | 8314 | Hoisting engineer | 452 |
| -054 | 8315 | Tower crane operator | 452 |
| -058 | 8315 | Tractor-crane operator | 452 |
| -062 | 8315 | Truck-crane operator | 452 |
| 929.683-014 | 8318 | Tractor operator | 452 |
| 930.382-010 | 654 | Driller machine | 387 |
| 930.482-010 | 654 | Drilling-machine operator | **387,388** |
| 930.665-010 | 654 | Long-wall-mining-machine tender | 387 |
| 930.666-014 | 656 | Tailer | 387 |
| 930.683-010 | 654 | Continuous-mining-machine operator | 387 |
| -014 | 654 | Cutter operator | 387 |
| 931.261-010 | 653 | Blaster | 387 |
| 932.683-014 | 8316 | Loading-machine operator | 387 |
| **950.362 through .585** | 8319, 6931-2, 7679 | Stationary engineers | 419 |
| 950.362-014 | 6931 | Refrigerating engineer | 450 |
| 951.685-010 | 696 | Firer, high pressure | 423, 450 |
| -014 | 7668 | Firer, low pressure | 423 |
| -018 | 7668 | Firer, marine | 423 |
| 951.686-010 | 8725 | Fuel-house attendant | 423 |
| 952.381-010 | 6881 | Switch inspector | 340 |
| 955.362-010 | 691 | Wastewater-treatment-plant operator | 421 |
| 955.585-010 | 691 | Wastewater-treatment-plant attendant | 421 |
| 961.367-010 | 4450 | Model, photographers' | 245 |
| 961.667-010 | 445 | Model, artists' | 245 |
| 962.162-010 | 1341 | Director, technical | 221 |
| 962.167-010 | 3719 | Manager, sound effects | 221 |
| 962.281-014 | 399 | Sound-effects technician | 221 |
| -018 | 399 | Special effects specialist | 221 |
| 962.362-014 | 399 | Light technician | 221 |
| 962.381-014 | 399 | Lighting-equipment operator | 340 |
| -018 | 6862 | Miniature-set constructor | 201 |
| 962.384-010 | 399 | Microphone-boom operator | 221 |
| 962.665-010 | 7679 | Dubbing-machine operator | 414 |
| 970.281-010 | 6863 | Airbrush artist | 414 |
| -018 | 6868 | Photograph retoucher | 414 |
| 970.361-014 | 6863 | Repeat chief | 413 |
| 970.381-010 | 6868 | Colorist, photograph | 414 |
| -018 | 6863 | Lay-out former | 201 |
| -034 | 6868 | Spotter, photographic | 414 |
| 970.661-014 | 6863 | Letterer | 201, 202 |
| 970.681-026 | 6863 | Painter, animated cartoons | 201 |
| 971.261-010 | 6823 | Etcher, hand | 413 |
| 971.382-018 | 7644 | Repeat photocomposing machine operator | 43 |
| -014 | 7444 | Photographer, photoengraving | 413 |
| 971.684-010 | 7756 | Blocker | 413 |
| 971.685-010 | 7644 | Roller-print tender | 413 |
| 972.281-010 | 6842 | Process artist | 408, 414 |
| -014 | 6842 | Process stripper | 408 |
| -018 | 6842 | Process artist, apprentice | 408, 414 |
| 972.381-010 | 6842 | Lithographic platemaker | 408 |
| 972.382-014 | 7444 | Photographer, lithographic | 408 |
| 973.381-010 | 6841 | Compositor | 398 |
| 974.381-010 | 6849 | Electrotyper | 424 |
| 974.382-014 | 6849 | Stereotyper | 424 |


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http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis

| D.O.T. Number | SOC Code | D.O.T. Title | Page |
|---|---|---|---|
| 976.267 through .361-010; .381-014 through .564-010; | 7820, 7479, 6868 6849, 6868, 7671, 7753, 4752 | Photographic process workers ..... | 414 |
| .665-010 through .685-030; and .687-014 through .687-022 | ([5]) | | |
| 977.381-010 | 6844 | Bookbinder ..... | 396 |
| 979.682-014 | 7645 | Blueprinting machine operator .... | 414 |

[1]4513, 4515, 4623–4, 4649, 4699, 4733, 4793, 4799

[2]4153, 4232–7, 4239, 4242–6, 4249, 4342–8, 4351–4, 4356, 4359, 4362, 4366–7, 4369, 4450

[3]382, 4757, 5512–5, 5611–7, 5619, 5621–2, 5624–7, 573, 71

[4]71, 7332–3, 7339, 7532–3, 7714, 7717, 7720

[5]4753, 6863, 725, 7671, 7678, 7720, 7753, 7757, 7759, 782.

Digitized for FRASER
http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis

# Index to Occupations


Page

A

Able seamen, *see*: Merchant marine sailors ..... 450
Academic librarians ..... 138
Account clerks, *see*: Bank clerks ..... 256
Account executives, *see*:
  Advertising workers ..... 235
  Securities sales workers ..... 250
Accountants ..... 23
Accounting clerks, *see*: Bookkeepers and accounting clerks ..... 259
Acquisitions librarians ..... 138
Actors and actresses ..... 212
Actuaries ..... 68
Adjusters, claim, insurance ..... 260
Administrative and managerial occupations ..... 22
Administrative assistants, *see*: City managers ..... 28
Administrative dietitians ..... 160
Administrative secretaries ..... 270
Administrative support occupations, including clerical ..... 255
Administrators, health services ..... 34
Administrators, medical record ..... 40
Administrators, school ..... 47
Admissions counselors, *see*: College student personnel workers ..... 30
Adult services librarians ..... 138
Advertising managers ..... 236
Advertising workers ..... 235
Aeronautical technicians ..... 224
Aerospace engineers ..... 58
Affirmative action coordinators, *see*:
  Personnel and labor relations specialists ..... 43
Agency cashiers ..... 241
Agents, *see*: Real estate agents and brokers ..... 247
Agents and brokers, insurance ..... 242
Agricultural accountants ..... 315
Agricultural and biological scientists ..... 88
Agricultural and forestry occupations ..... 313
Agricultural chemical sales workers ..... 315
Agricultural commodity graders, *see*:
  Agricultural occupations ..... 316
  Health-regulatory inspectors ..... 36
Agricultural economists ..... 315
Agricultural engineers ..... 59, 314
Agricultural journalists ..... 315
Agricultural marketing specialists ..... 315
Agricultural occupations ..... 313
Agricultural pilots ..... 315
Agricultural quarantine inspectors ..... 36
Agricultural technicians ..... 225
  *See also*: Agricultural occupations ..... 314
Agricultural vocational teachers ..... 315
Agronomists, *see*:
  Agricultural occupations ..... 314
  Agricultural and biological scientists ..... 88
Air-conditioning and refrigeration mechanics ..... 345
Air-conditioning, heating, and refrigeration mechanics ..... 345
Air-conditioning, heating, and refrigeration technicians ..... 224
Air safety inspectors ..... 36
Air traffic controllers ..... 219

Page

Aircraft mechanics ..... 321
  *See also*: Agricultural occupations ..... 313
Airline reservation and ticket agents ..... 255
Airplane pilots ..... 445
Airport traffic controllers ..... 219
Alcohol, tobacco, and firearms inspectors ..... 36
All-round darkroom technicians, *see*: Photographic process workers ..... 414
Ambulance attendants, *see*: Emergency medical technicians ..... 180
Ambulance drivers, *see*: Emergency medical technicians ..... 180
Anatomists, *see*: Agricultural and biological scientists ..... 88
Animal caretakers, *see*: Agricultural occupations ..... 313
Animal scientists, *see*: Agricultural and biological scientists ..... 89
Animators, *see*: Commercial artists ..... 201
Announcers, radio and television ..... 195
Anthropologists ..... 101
Anthropometrists ..... 102
Appliance repairers ..... 330
Arc welders ..... 436
Archeologists, *see*: Anthropologists ..... 101
Architects ..... 51
Architects, landscape ..... 53
Archivists, *see*: Historians ..... 106
Armed Forces, *see*: Military occupations ..... 457
Art directors, *see*:
  Advertising workers ..... 235
  Commercial artists ..... 201
Artists, commercial, *see*:
  Advertising workers ..... 235
  Commercial artists ..... 201
Artists' models ..... 245
Assemblers ..... 433
Assistant city managers ..... 28
Assistant principals, *see*: School administrators ..... 47
Assistant professors, *see*: College and university faculty ..... 131
Assistant superintendents, *see*: School administrators ..... 47
Associate professors, *see*: College and university faculty ..... 131
Astrogeologists ..... 81
Astronomers ..... 75
Astrophysicists, *see*: Astronomers ..... 75
Attorneys ..... 97
Audio control technicians, *see*: Broadcast technicians ..... 221
Audiologists ..... 172
Audiovisual librarians ..... 138
Automatic transmission specialists, *see*: Automobile mechanics ..... 324
Automobile air-conditioning specialists, *see*: Automobile mechanics ..... 324
Automobile body repairers ..... 323
Automobile electricians, *see*: Automobile mechanics ..... 324
Automobile-glass mechanics, *see*: Automobile mechanics ..... 324
Automobile mechanics ..... 324




Digitized for FRASER
http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis

Page

Automobile painters ..... 434
See also: Automobile body repairers ..... 323
Automobile parts counter managers ..... 237
Automobile parts counter workers ..... 237
Automobile-radiator mechanics, see: Automobile mechanics ..... 324
Automobile repair service estimators ..... 394
Automobile sales workers ..... 239
Automobile service advisors see: Automobile repair service estimators ..... 394
Auxiliary equipment operators, see: Computer operating personnel ..... 263

B

Bank clerks ..... 256
Bank officers and managers ..... 25
Bank tellers ..... 258
Barbers ..... 307
Bartender helpers ..... 290
Bartenders ..... 290
Beauticians, see: Cosmetologists ..... 309
Beauty operators, see Cosmetologists ..... 309
Bell captains ..... 308
Bellhops and bell captains ..... 308
Bench coremakers, see: Coremakers ..... 399
Bench molders, see: Molders ..... 409
Bench technicians, see: Ophthalmic laboratory technicians ..... 410
Benefits specialists, see: Personnel and labor relations specialists ..... 43
Bibliographers, see: Librarians ..... 138
Biochemists ..... 90
Biographers, see: Historians ..... 106
Biological oceanographers ..... 84
Biological scientists, see: Agricultural and biological scientists ..... 88
Biological technicians ..... 225, 314
Biologists, see: Agricultural and biological scientists ..... 88
Biomedical engineers ..... 60
Blasters, see: Coal mining operatives ..... 387, 388
Blue-collar worker supervisors ..... 390
Boatswains, see: Merchant marine sailors ..... 450
Body repairers, automobile ..... 323
Boiler tenders ..... 423
See also: Stationary engineers ..... 419
Boilermakers ..... 395
Boilermaking occupations ..... 395
Book designers ..... 202
Bookbinders and bindery workers ..... 354
Bookkeepers ..... 259
See also: Bank clerks ..... 256
Bookkeepers and accounting clerks ..... 259
Bookkeeping machine operators, see: Bank clerks ..... 257
Bookmobile librarians ..... 138
Bordereau clerks, see: Typists ..... 276
Bosuns, see: Merchant marine sailors ..... 450
Botanists, see: Agricultural and biological scientists ..... 88
Bowling-pin-machine mechanics, see: Pinsetter mechanics ..... 354
Box office cashiers ..... 240
Braille operators, see: Typists ..... 276
Braille typists, see: Typists ..... 276
Brake mechanics, see: Automobile mechanics ..... 324

Page

Bricklayers ..... 363
Bricklayers and stonemasons ..... 363
Bricklayers' tenders, see: Construction laborers ..... 455
Broadcast technicians ..... 221
Brokers, real estate ..... 247
Building inspectors ..... 32
Bulldozer operators, See: Coal mining operatives ..... 387
Operating Engineers ..... 452
Bus mechanics ..... 328
Busdrivers, intercity ..... 439
Busdrivers, local transit ..... 440
Business machine repairers ..... 346
Buyers ..... 26

C

Cable splicers, see: Line installers and cable splicers ..... 338
Camera operators, printing, see: Lithographers ..... 408
Captain, see: Airplane pilots ..... 445
Merchant marine officers ..... 447
Card-type converter operators, see: Bank clerks ..... 256
Career planning counselors, college, see: College career planning and placement counselors ..... 129
College student personnel workers ..... 30
Carpenters ..... 364
Carpet installers, see: Floor covering installers ..... 371
Cartographers, see: Geographers ..... 77
Cartoonists ..... 201
Caseworkers, see: Social workers ..... 119
Cashiers ..... 240
Cashier checkers ..... 241
Casualty insurance agents ..... 242
Catalogers, see: Librarians ..... 138
Catholic priests ..... 127
Cement masons and terrazzo workers ..... 366
Central office craft occupations ..... 331
Central office equipment installers ..... 333
Central office operators, telephone ..... 274
Central office repairers, telephone ..... 331
Ceramic engineers ..... 60
Certified public accountants ..... 23
Chain workers, see: Surveyors ..... 54
Check encoders, see: Bank clerks ..... 256
Check inscribers, see: Bank clerks ..... 256
Check-out clerks, see: Cashiers ..... 241
Checkers, see: Drafters ..... 222
Cashiers ..... 241
Chefs, see: Cooks and chefs ..... 291
Chemical engineers ..... 61
Chemical mixers, see: Photographic process workers ..... 414
Chemical oceanographers ..... 85
Chemical technicians ..... 225
Chemists ..... 76
Chief cooks, see: Merchant marine sailors ..... 450
Chief engineers, see: Merchant marine officers ..... 448
Broadcast technicians ..... 221
Chief mates, see: Merchant marine officers ..... 448
Chief officers, see: Merchant marine officers ..... 448


Digitized for FRASER
http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis

Page

Chief stewards, *see*: Merchant marine sailors ..... 450
Child health associates ..... 167
Child welfare workers, *see*: Social workers ..... 119
Children's librarians ..... 138
Chiropractors ..... 147
Circulation clerks, *see*: Library technicians and assistants ..... 229
City managers ..... 28
City planners ..... 117
Civil engineering technicians ..... 224
Civil engineers ..... 62
Claim adjusters, insurance ..... 260
Claim examiners, insurance ..... 261
Claim representatives, insurance ..... 260
Classifiers, *see*: Librarians ..... 138
Cleaning and building service occupations ..... 305
Clerk-typists ..... 276
Clerks, *see*:
- Account clerks, bank clerks ..... 256
- Accounting clerks, bookkeeping workers ..... 259
- Bank clerks ..... 256
- Bookkeeping clerks ..... 259
- Check-out clerks, cashiers ..... 241
- Clerk-typists ..... 276
- Control clerks, bank clerks ..... 256
- Distribution clerks, postal clerks ..... 268
- Exchange clerks, bank clerks ..... 256
- Interest clerks, bank clerks ..... 256
- Medical record clerks ..... 186
- Mortgage clerks, bank clerks ..... 256
- Postal clerks ..... 268
- Posting clerks, bank clerks ..... 256
- Rack clerks, hotel ..... 264
- Reconcilement clerks, bank clerks ..... 256
- Recording clerks, bank clerks ..... 256
- Reservation clerks, hotel ..... 265
- Room and desk clerks, hotel ..... 265
- Transit clerks, bank clerks ..... 256
- Trust securities clerks, bank clerks ..... 256
- Window clerks, postal clerks ..... 268

Climatologic geographers ..... 77
Climatologists, *see*: Meteorologists ..... 83
Clinical dietitians ..... 160
Clinical laboratory workers ..... 184
Coal mining operatives ..... 387
Collection workers ..... 262
College and university faculty ..... 131
College career planning and placement counselors ..... 129
College placement officers, *see*:
- College career planning and placement counselors ..... 129
- College student personnel workers ..... 30

College student personnel workers ..... 30
College union staff members ..... 30
Color-laboratory technicians, *see*: Photographic process workers ..... 414
Color-printer operators, *see*: Photographic process workers ..... 414
Commercial account underwriters ..... 49
Commercial and graphic artists and designers ..... 201, 235
Commercial decorators ..... 204
Commercial photographers ..... 209
Commercial tellers, *see*: Bank tellers ..... 258
Commodity loan clerks, *see*: Bank clerks ..... 256
Communication-center operators, *see*: Telephone operators ..... 274
Communications occupations ..... 193

Page

Community dietitians ..... 160
Community health nurses ..... 169
Community outreach librarians ..... 138
Community planners ..... 117
Compensation analysts, *see*: Personnel and labor relations specialists ..... 43
Compensation managers, *see*: Personnel and labor relations specialists ..... 43
Compositors ..... 398
Computer operating personnel ..... 263
Computer operators, *see*: Computer operating personnel ..... 263
Computer programmers, *see*: Programmers ..... 230
Computer service technicians ..... 335
Conservationists, soil ..... 95
Console operators, *see*:
- Bank clerks ..... 256
- Computer operating personnel ..... 263

Construction and extractive occupations ..... 360
Construction electricians ..... 369
Construction inspectors (government) ..... 32
Construction laborers ..... 455
Construction machinery operators, *see*: Operating engineers ..... 452
Construction occupations ..... 361
Consumer safety inspectors ..... 36
Continuous mining machine operators, *see:* Coal mining operatives ..... 387
Contour wire specialists, denture, *see*: Dental laboratory technicians ..... 401
Control clerks, *see*: Bank clerks ..... 256
Cooks and chefs ..... 291
Cooperative extension service workers ..... 133
*See also*: Agricultural occupations ..... 315
Copilots ..... 445
Copywriters ..... 235
Coremakers (foundry) ..... 399
Corporate designers, *see*: Industrial designers ..... 206
Correction officers ..... 280
Correction sergeants ..... 280
Correspondent bank officers ..... 25
Correspondents, *see*: Reporters and correspondents ..... 196
Cosmetologists ..... 309
Counselors, *see*:
- College career planning and placement counselors ..... 129
- College student personnel workers ..... 30
- Employment counselors ..... 134
- Rehabilitation counselors ..... 141
- School counselors ..... 143

Counter workers, food ..... 293
Country collection clerks, *see*: Bank clerks ..... 257
Court reporters ..... 270
Cow testers, *see*: Agricultural occupations ..... 315
Crane operators, *see*: Operating engineers ..... 452
Credit managers ..... 33
Cryptographic-machine operators, *see*: Typists ..... 276
Curators, *see*: Historians ..... 106
Customer engineers, *see*:
- Business machine repairers ..... 346
- Computer service technicians ..... 335

Customers' brokers, *see*: Securities sales workers ..... 250
Customs inspectors ..... 36
Cutter operators, *see*: Coal mining operatives ..... 387
Cytotechnologists, *see:* Medical laborataory workers ..... 184


Digitized for FRASER
http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis

Page

## D

Dancers ..... 214
Darkroom technicians, *see*: Photographic process workers ..... 414
Data converting machine operators, *see*: Bank clerks ..... 256
Data examination clerks ..... 256
Data typists, *see*: Bank clerks ..... 256
Dean of students, *see*: College student personnel workers ..... 30
Deck officers, *see*: Merchant marine officers ..... 447
Deck utility hands, *see*: Merchant marine sailors ..... 450
Dental assistants ..... 298
Dental ceramists, *see*: Dental laboratory technicians ..... 401
Dental hygienists ..... 175
Dental laboratory technicians ..... 401
Dentists ..... 148
Denture contour wire specialists ..... 401
Departmental head assistants, *see*: City managers ..... 28
Deputy sheriffs ..... 287
Design occupations ..... 201
Designers ..... 201
Designers, book ..... 202
Designers, floral ..... 204
Designers, graphic ..... 202
Designers, industrial ..... 206
Designers, interior ..... 207
Designers, package ..... 202
Designers, textile ..... 202
Desk attendants, *see*: Library technicians and assistants ..... 229
Detailers, *see*: Drafters ..... 222
Detectives, *see*: Police officers ..... 286
Developers, *see*: Photographic process workers ..... 414
Diemakers, *see*: Tool-and-die makers ..... 417
Diesel mechanics ..... 328
Diesinkers, *see*: Forge shop occupations ..... 425
Dietetic educators ..... 160
Dietitians ..... 160
Dining room attendants and dishwashers, *see*: Waiters assistants and kitchen helpers ..... 296
Directors of admissions ..... 30
Directors of placement ..... 30
Directors of residence life ..... 30
Directors of student affairs ..... 30
Directory assistance operators ..... 274
Dishwashers, *see*: Waiter's assistants and kitchen helpers ..... 296
Dispensing opticians ..... 402
*See also*: Optometrists ..... 150
Display workers (retail trade) ..... 203
Distribution clerks, *see*: Postal clerks ..... 268
Doctors, medical ..... 153
Doctors, osteopathic ..... 152
Drafters ..... 222
Dragline operators, *see*: Coal mining operatives ..... 387
Drilling machine operators, *see*: Coal mining operatives ..... 387
Drivers, *see*:
Intercity busdrivers ..... 439
Local transit busdrivers ..... 440
Local truckdrivers ..... 442
Long-distance truckdrivers ..... 443
Druggists, see: Pharmacists ..... 163
Drywall installers and finishers ..... 368

## E

Ecologists, *see*: Agricultural and biological scientists ..... 89
Economic geographers ..... 77
Economic geologists ..... 81
Economists ..... 104
Editors, *see*: Writers and editors ..... 199
EEG technicians ..... 179
EEG technologists ..... 179
EKG technicians ..... 177
Electric sign repairers ..... 336
Electrical engineers ..... 62
Electrical inspectors ..... 32
Electricians, *see also*:
Central office craft occupations ..... 331
Merchant marine sailors ..... 450
Electricians, construction ..... 369
Electricians, maintenance ..... 340
Electrocardiograph technicians ..... 177
Electroencephalographic technicians ..... 179
Electroencephalographic technologists ..... 179
Electronic computer programmers ..... 230
Electronic engineers, *see*: Electrical engineers ..... 62
Electronic organ technicians ..... 354
Electronic reader-sorter operators, *see*: Bank clerks ..... 256
Electronics technicians ..... 224
Electrotypers and stereotypers ..... 424
Elementary school teachers ..... 135
Elevator constructors ..... 348
Elevator mechanics, *see*: Elevator constructors ..... 348
Embryologists, *see*: Agricultural and biological scientists ..... 88
Emergency medical technicians ..... 180
Employment counselors ..... 134
Employment interviewers, personnel ..... 43
Encoders, *see*: Bank clerks ..... 256
Endodontists ..... 148
Engineering aides, *see*: Engineering and science technicians ..... 223
Engineering and science technicians ..... 223
Engineering geologists ..... 81
Engineering technicians ..... 223
Engineers ..... 57
*See also*:
Aerospace engineers ..... 58
Agricultural engineers ..... 59
Biomedical engineers ..... 60
Ceramic engineers ..... 60
Chemical engineers ..... 61
Civil engineers ..... 62
Electrical engineers ..... 62
Electronic engineers ..... 62
Industrial engineers ..... 63
Mechanical engineers ..... 63
Metallurgical engineers ..... 64
Mining engineers ..... 64
Petroleum engineers ..... 65
Engineers, stationary ..... 419
Engineers, surveyors and architects ..... 51
Enroute controllers, air traffic ..... 219
Entomologists ..... 88
Environmental health inspectors ..... 36


Digitized for FRASER
http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis

Page

Ethnologists, *see*: Anthropologists ..... 101
Exchange clerks, *see*: Bank clerks ..... 256
Experimental machinists, *see*: Instrument makers (mechanical) ..... 405
Exploration geophysicists ..... 82
Extension agents, *see*: Cooperative extension service workers ..... 133
Extractive occupations ..... 387

F

Family service workers, *see*: Social workers ..... 119
Farm equipment mechanics ..... 315, 326
Farm equipment sales workers, *see*: Agricultural occupations ..... 315
Farm laborers, *see*: Agricultural occupations ..... 313
Farm operators, *see*: Agricultural occupations ..... 313
Farm supervisors, *see*: Agricultural occupations ..... 314
Farmers, *see*: Agricultural occupations ..... 313
Fashion illustrators ..... 201
Fashion models ..... 245
FBI special agents ..... 282
Field engineers, *see*:
  Business machine repairers ..... 346
  Computer service technicians ..... 335
Field technicians, *see*: Broadcast technicians ..... 221
Financial aid counselors ..... 30
Financial aid officers ..... 30
Finishers, *see*: Ophthalmic laboratory technicians ..... 410
Fire protection engineers ..... 41
Firefighters ..... 282
Firers/watertenders, *see*: Merchant marine sailors ..... 450
First assistant engineers, *see*: Merchant marine officers ..... 448
First mates, *see*: Merchant marine officers ..... 448
Fitters, boilermaking occupations ..... 395
Fitting models ..... 245
Flight attendants ..... 311
Flight engineers, *see*: Airplane pilots ..... 445
Floor coremakers, *see*: Coremakers ..... 399
Floor covering installers ..... 371
Floor covering mechanics ..... 371
Floor molders, *see*: Molders ..... 409
Floral designers ..... 204
Food and beverage preparation and service occupations ..... 290
Food counter workers ..... 293
Food inspectors ..... 36
Food technologists ..... 91
Foreign buyers ..... 26
Foreign student advisers ..... 30
Foremen and forewomen ..... 390
Foresters ..... 92
Forestry aides ..... 318
Forestry technicians ..... 313,318
Forge shop occupations ..... 425
Frame wirers, *see*: Telephone central office craft occupations ..... 331
Freelance reporters ..... 196
Front-end mechanics, *see*: Automobile mechanics ..... 324
Front-office cashiers ..... 241
Front-office clerks, hotel ..... 265
Furnace installers, *see*: Air-conditioning, heating, and refrigeration mechanics ..... 345
Furniture upholsterers ..... 404

Page

G

Gas appliance servicers ..... 330
Gas burner mechanics, *see*: Air-conditioning, heating, and refrigeration mechanics ..... 345
Gas fitters, *see*: Plumbers and pipefitters ..... 380
Gas welders ..... 436
Genealogists, *see*: Historians ..... 106
General bookkeepers ..... 259
General stenographers ..... 270
Geochemists, *see*: Geologists ..... 80
Geochronologists, *see*: Geologists ..... 80
Geodesists, *see*: Geophysicists ..... 82
Geographers ..... 77
Geological oceanographers ..... 81
  *See also*: Oceanographers ..... 85
Geological technicians ..... 225
Geologists ..... 80
Geomagneticians, *see*: Geophysicists ..... 82
Geomorphologists, *see*: Geologists ..... 80
Geophysicists ..... 82
Glaziers ..... 372
Graphic designers ..... 201
Grinders, *see*: Forge shop occupations ..... 425
Grocery clerks, *see*: Cashiers ..... 240
Guards ..... 284
Guidance counselors ..... 143

H

Hairstylists, *see*:
  Barbers ..... 307
  Cosmetologists ..... 309
Hammer operators, *see*: Forge shop occupations ..... 425
Hammersmiths, *see*: Forge shop occupations ..... 425
Hand compositors, printing ..... 398
Health and regulatory inspectors (government) ..... 36
Health diagnosing and treating practitioners ..... 147
Health service occupations ..... 298
Health services administrators ..... 34
Health technologists and technicians ..... 175
Heat treaters, *see*: Forge shop occupations ..... 425
Heaters, *see*: Forge shop occupations ..... 425
Heating mechanics ..... 345
Helpers, handlers, equipment cleaners, and laborers ..... 455
High school teachers ..... 144
High speed printer operators, *see*:
  Bank clerks ..... 256
  Computer operating personnel ..... 263
Highway patrol officers, *see*: State police officers ..... 287
Histologic technicians; *see*: Medical laboratory workers ..... 184
Historians ..... 106
Hod carriers, *see*:
  Bricklayers ..... 363
  Construction laborers ..... 455
Horticulturists ..... 89
Hospital nurses ..... 169
Hotel front-office clerks ..... 265
Hotel housekeepers and assistants ..... 305
Hotel managers and assistants ..... 38
Housekeepers and assistants, hotel ..... 305
Hydrologic technicians ..... 225


Digitized for FRASER
http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis

Page

Hydrologists, *see*: Geophysicists ..... 82
Hygienists, dental ..... 175

## I

Immigration inspectors ..... 36
Industrial buyers, *see*: Purchasing agents ..... 46
Industrial designers ..... 206
Industrial engineers ..... 63
Industrial hygienists, *see*: Occupational safety and health workers ..... 41
Industrial machinery repairers ..... 350
Industrial nurses ..... 169
Industrial photographers ..... 209
Industrial engineering technicians ..... 224
Information scientists, *see*: Librarians ..... 138
Inhalation therapy workers ..... 171
Inspectors, construction ..... 32
Inspectors, health and regulatory ..... 36
Instructors, *see*: College and university faculty ..... 131
Instrument assistants ..... 54
Instrument makers (mechanical) ..... 405
Instrument repairers, *see*: Central office craft occupations ..... 331
Instrumentation technicians ..... 225
Insulation workers ..... 374
Insurance agents and brokers ..... 242
Intercity busdrivers ..... 439
Interest clerks, *see*: Bank clerks ..... 257
Interior decorators, *see*: Interior designers ..... 207
Interior designers ..... 207
International officers, *see*: Bank officers and managers ..... 25
Ironworkers ..... 375

## J

Jewelers ..... 407
Job analysts ..... 43
Journalists, *see*: Reporters and correspondents ..... 196

## K

Keypunch operators, *see*: Computer operating personnel ..... 263
Kindergarten teachers ..... 135
Kitchen helpers, *see*: Waiters assistants and kitchen helpers ..... 296

## L

Laboratory technicians, dental ..... 401
Laboratory workers, medical ..... 184
Labor relations specialists ..... 43
Laborers, construction ..... 455
Land surveyors ..... 54
Landscape architects ..... 53
Lawyers ..... 97
Layout artists ..... 202, 236
Layout workers, boilermaking occupations ..... 395
Legal assistants ..... 227

Page

Legal secretaries ..... 270
Lens grinders, *see*: Ophthalmic laboratory technicians ..... 410
Letterers ..... 202
Letter sorting machine clerks, postal ..... 268
Librarians ..... 138
Library assistants ..... 229
Library attendants ..... 229
Library clerks ..... 229
Library helpers ..... 229
Library technicians and assistants ..... 229
Licensed practical nurses ..... 183
Life insurance agents ..... 242
Life scientists ..... 88
*See also*: Agricultural and biological scientists ..... 88
Life underwriters ..... 49
Lighting technicians, *see*: Broadcast technicians ..... 221
Limnologists, *see*: Oceanographers ..... 84
Line installers and cable splicers ..... 338
Linguistic anthropologists ..... 101
Linotype machine operators, printing ..... 398
Lithographers ..... 408
Loading machine operators, *see*: Coal mining operatives ..... 387, 388
Loan officers, *see*: Bank officers and managers ..... 25
Local transit busdrivers ..... 440
Local truckdrivers ..... 442
Long-distance operators, telephone ..... 274
Long-distance truckdrivers ..... 443
Longwall mining machine operators, *see*: Coal mining operatives ..... 387, 388
Loss control consultants, *see*: Occupational safety and health workers ..... 41

## M

Machine coremakers, *see*: Coremakers ..... 399
Machine molders, *see*: Molders ..... 409
Machine drillers, *see*: Coal mining operatives ..... 387
Machine operators, tenders, and setup workers ..... 423
Machine tool operators ..... 427
Machine tool setup workers ..... 429
Machinery repairers, industrial ..... 350
Machinists, all-round, *see*: All-round machinists ..... 392
Magnetic-tape-typewriter operators ..... 277
Mail carriers ..... 267
Mailhandlers, *see*: Postal clerks ..... 268
Maintenance electricians ..... 340
Maintenance mechanics, *see*: Industrial machinery repairers ..... 350
Maintenance technicians, *see*: Broadcast technicians ..... 221
Management analysts, *see*: City managers ..... 28
Managers, city ..... 28
Manicurists, *see*: Cosmetologists ..... 309
Manufacturers' sales workers ..... 243
Marble setters, *see*: Bricklayers and stonemasons ..... 363
Marine biologists, *see*: Oceanographers ..... 84
Marine geologists, *see*: Geologists ..... 81
Marketing and sales occupations ..... 235
Market research analysts ..... 109
Marketing research workers ..... 236
Masters, *see*: Merchant marine officers ..... 448


Digitized for FRASER
http://fraser.stlouisfed.org/
Federal Reserve Bank of St. Louis

Page

Material moving occupations, *see*: Transportation and material moving occupations ..... 438
Mates, *see*: Merchant marine officers ..... 447
Mathematical scientists and systems analysts ..... 68
Mathematical technicians ..... 225
Mathematicians ..... 70
Meatcutters ..... 294
Meat and poultry inspectors ..... 315
Mechanical engineers ..... 63
Mechanical inspectors ..... 32
Mechanical engineering technicians ..... 224
Mechanics, *see*:
- Air-conditioning mechanics ..... 345
- Aircraft mechanics ..... 321
- Automobile mechanics ..... 324
- Bus mechanics ..... 328
- Farm equipment mechanics ..... 315, 326
- Gas burner mechanics ..... 345
- Oil burner mechanics ..... 345
- Pinsetter mechanics ..... 355
- Truck mechanics ..... 328
- Vending machine mechanics ..... 356

Mechanics and repairers ..... 320
Media assistants ..... 236
Media buyers ..... 236
Media directors ..... 236
Media specialists, *see*: Librarians ..... 138
Medical assistants ..... 299
Medical geographers, *see*: Geographers ..... 77
Medical illustrators ..... 201
Medical laboratory assistants ..... 184
Medical laboratory technicians ..... 184
Medical office assistants ..... 299
Medical record administrators ..... 40
Medical record technicians and clerks ..... 186
Medical secretaries ..... 270
Medical social workers ..... 119
Medical technologists ..... 184
Membership secretaries ..... 271
Merchandise displayers, *see*: Display workers ..... 203
Merchandise managers, *see*: Buyers ..... 26
Merchant marine officers ..... 447
Merchant marine sailors ..... 450
Mess attendants, *see*: Merchant marine sailors ..... 450
Metal patternmakers, *see*: Patternmakers ..... 412
Metallurgical engineers ..... 64
Meteorological technicians ..... 225
Meteorologists ..... 83
Microbiologists, *see*: Agricultural and biological scientists ..... 88
Military occupations ..... 457
Millwrights ..... 351
Mineralogists, *see*: Geologists ..... 81
Mining engineers ..... 64
Ministers, Protestant ..... 124
Mobile equipment and vehicle mechanics and repairers ..... 321
Model dressers, *see*: Display workers ..... 203
Model makers, *see*: Instrument makers (mechanical) ..... 405
Models ..... 245
Molders (foundry) ..... 409
Monotype keyboard operators, printing ..... 398
Mortgage clerks, *see*: Bank clerks ..... 257
Mortgage processing clerks ..... 257
Motor vehicle body repairers ..... 323

Page

Motor vehicle repairers ..... 324, 328
Musicians ..... 215

## N

Natural scientists and mathematicians ..... 67
Neon sign repairers ..... 336
Newscasters, *see*: Radio and television announcers and newscasters ..... 195
Newspaper reporters, *see*: Reporters and correspondents ..... 196
Nurse educators, *see*: Registered nurses ..... 169
Nurse practitioners ..... 169
Nurses, *see*:
- Licensed practical nurses ..... 183
- Registered nurses ..... 169

Nutritionists, *see*: Dietitians ..... 160

## O

Occupational health consultants ..... 41
Occupational health nurses ..... 169
Occupational safety and health inspectors, *see*: Health and regulatory inspectors ..... 36
Occupational safety and health workers ..... 41
Occupational therapists ..... 161
Occupational therapy assistants ..... 301
Oceanographers ..... 84
Oceanographic engineers, *see*: Oceanographers ..... 85
Office electricians, *see*: Central office craft occupations ..... 331
Office machine repairers ..... 346
Office nurses ..... 169
Oil burner mechanics, *see*: Air-conditioning, heating, and refrigeration mechanics ..... 345
Oilers, *see*:
- Merchant marine sailors ..... 450
- Operating engineers ..... 452

Operating engineers, (construction machinery operators) ..... 452
Operating room technicians, *see*: Surgical technicians ..... 190
Operations officers, *see*: Bank officers and managers ..... 25
Operators, telephone ..... 274
Ophthalmic dispensers ..... 402
Ophthalmic laboratory technicians ..... 410
Optical mechanics ..... 410
Opticians, dispensing ..... 402
Optometric assistants ..... 302
Optometric technicians, *see*: Optometric assistants ..... 302
Optometrists ..... 150
Oral pathologists ..... 148
Oral surgeons ..... 148
Ordinary seamen, *see*: Merchant marine sailors ..... 450
Ornamental ironworkers ..... 376
Orthodontic technicians ..... 401
Orthodontists ..... 148
Orthopedic physician assistants ..... 167
Osteopathic physicians ..... 152

## P

Package designers ..... 202
Painters, automobile ..... 434


Digitized for FRASER
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Federal Reserve Bank of St. Louis

| | Page |
|---|---|
| Painters, production | 431 |
| Painters and paperhangers | 377 |
| Paleomagneticians, *see*: Geophysicists | 82 |
| Paleontologists, *see*: Geologists | 81 |
| Paperhangers | 377 |
| Paralegals, *see*: Legal assistants | 227 |
| Paramedics, *see*: Emergency medical technicians | 180 |
| Paraoptometrics, *see*: Optometric assistants | 302 |
| Parts counter managers, *see*: Automobile parts counterworkers | 237 |
| Party chiefs, *see*: Surveyors and surveying technicians | 54 |
| Passenger agents, *see*: Airline reservation and ticket agents | 255 |
| Paste-up workers | 202 |
| Pathologists, *see*: | |
| Agricultural and biologic scientists | 88 |
| Medical laboratory workers | 184 |
| Pathologists, speech | 172 |
| Patrol officers, *see*: | |
| Police officers | 286 |
| State police officers | 287 |
| Patternmakers (foundry) | 412 |
| PBX attendants, *see*: Telephone operators | 274 |
| PBX installers and repairers, telephone | 341 |
| PBX operators, *see*: Telephone operators | 294 |
| PBX repairers | 341 |
| Pedodontists | 148 |
| Perforator typists, *see*: Typists | 276 |
| Performing artists | 212 |
| Periodontists | 148 |
| Personal service occupations | 307 |
| Personnel and labor relations specialists | 43 |
| Petroleum engineers | 65 |
| Petroleum geologists | 81 |
| Pharmacists | 163 |
| Pharmacologists, *see*: Agricultural and biological scientists | 88 |
| Photocheckers and assemblers, *see*: Photographic process workers | 414 |
| Photoengravers | 413 |
| Photofinishing laboratory workers | 414 |
| Photogrammetrists, *see*: Surveyors and surveying technicians | 55 |
| Photograph retouchers, *see*: Photographic process workers | 414 |
| Photographers | 209 |
| Photographic models, *see*: Models | 245 |
| Photographic process workers | 414 |
| Photographic technicians | 414 |
| Photojournalists, *see*: Photographers | 209 |
| Phototypesetters, printing | 398 |
| Physical anthropologists | 101 |
| Physical geographers | 77 |
| Physical meteorologists | 83 |
| Physical oceanographers | 85 |
| Physical scientists | 75 |
| Physical therapist assistants | 303 |
| Physical therapists | 165 |
| Physician assistants | 167 |
| Physicians, medical | 153 |
| Physicians, osteopathic | 152 |
| Physicists | 86 |
| Physiologists | 88 |
| Piano and organ tuners and repairers | 353 |
| Piano technicians | 353 |
| Piano tuners | 353 |
| Picklers, *see*: Forge shop occupations | 425 |
| Pilots and copilots | 445 |
| Pinsetter mechanics | 354 |
| Pipefitters | 380 |
| Pipelayers, *see*: Construction laborers | 455 |
| Pipe-organ repairers | 353 |
| Placement directors and counselors, college, *see*: | |
| College career planning and placement counselors | 129 |
| College student personnel workers | 30 |
| Plainclothes officers, *see*: Police officers | 286 |
| Planetologists, *see*: Geophysicists | 82 |
| Planning counselors, college | 129 |
| Plant and systems operators | 419 |
| Plasterers | 379 |
| Plasterers' tenders, *see*: Construction laborers | 455 |
| Plumbers and pipefitters | 380 |
| Podiatrists | 156 |
| Police district switchboard operators, *see*: Telephone operators | 274 |
| Police officers | 286 |
| *See also*: State police officers | 287 |
| Political geographers | 77 |
| Political scientists | 110 |
| Portrait photographers | 209 |
| Postal clerks | 268 |
| Posting clerks, *see*: Bank clerks | 256 |
| Posting machine operators, *see*: Bank clerks | 256 |
| Practical nurses, licensed | 183 |
| Precision production occupations | 392 |
| Press operators, *see*: Forge shop occupations | 425 |
| Press operators, printing | 430 |
| Priests, Roman Catholic | 127 |
| Principals, *see*: School administrators | 47 |
| Print controllers, *see*: Photographic process workers | 414 |
| Print developers, automatic, *see*: Photographic process workers | 414 |
| Print shop stenographers, *see*: Secretaries and stenographers | 270 |
| Print washers, *see*: Photographic process workers | 414 |
| Printers, *see*: Photographic process workers | 414 |
| Printing press operators and assistants | 430 |
| Private-branch-exchange service advisors, *see*: Telephone operators | 274 |
| Private duty nurses | 169 |
| Professors, *see*: College and university faculty | 131 |
| Production managers | 236 |
| Production occupations | 390 |
| Production painters | 431 |
| Production technicians, *see*: Engineering and science technicians | 223 |
| Programmers | 230 |
| Projection printers, *see*: Photographic process workers | 414 |
| Proof machine operators, *see*: Bank clerks | 256 |
| Prosthodontists | 148 |
| Protestant ministers | 124 |
| Psychiatric social workers | 119 |
| Psychologists | 112 |
| Public health dentists | 148 |
| Public librarians | 138 |
| Public relations workers | 193 |
| Public works inspectors | 32 |
| Purchasing agents | 46 |
| Pursers, *see*: Merchant marine officers | 447 |


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Federal Reserve Bank of St. Louis

## R


Page

Rabbis ..... 125
Radio and television announcers and newscasters ..... 195
Radio officers, *see*: Merchant marine officers ..... 447
Radio service technicians ..... 343
Radiologic (X-ray) technologists ..... 188
Range conservationists, *see*: Range managers ..... 94
Range ecologists, *see*: Range managers ..... 94
Range managers ..... 94
Range scientists, *see*: Range managers ..... 94
Real estate agents and brokers ..... 247
Realtors ..... 247
Receptionists ..... 269
Reconcilement clerks, *see*: Bank clerks ..... 257
Recording clerks, *see*: Bank clerks ..... 256
Recording technicians, radio and television, *see*:
  Broadcast technicians ..... 221
Recreation workers ..... 121
Recruiters, *see*: Personnel and labor relations
  specialists ..... 43
Reference librarians ..... 138
Refrigeration engineers, *see*: Merchant marine
  sailors ..... 450
Refrigeration mechanics ..... 345
Regional geographers ..... 77
Regional planners, *see*: Urban and regional
  planners ..... 117
Registered nurses ..... 169
Registered representatives, *see*: Securities
  sales workers ..... 250
Regulatory inspectors, *see*: Health and
  regulatory inspectors ..... 36
Rehabilitation counselors ..... 141
Reinforcing metal workers ..... 376
Religious workers ..... 124
Repair service estimators, automobile ..... 394
Renal social workers ..... 119
Repairers, *see*:
  Appliance repairers ..... 330
  Automobile body repairers ..... 323
  Business machine repairers ..... 346
  Central office repairers, telephone ..... 331
  Electric sign repairers ..... 336
  Industrial machinery repairers ..... 350
  Neon-sign repairers ..... 336
  Piano and organ tuners and repairers ..... 353
  Shoe repairers ..... 416
  Telephone and PBX repairers ..... 341
  Watch repairers ..... 358
Reporters and correspondents ..... 196
Research analysts, market ..... 109
Research dietitians ..... 160
Reservation agents, *see*: Airline reservation and
  ticket agents ..... 255
Reservation clerks, hotel ..... 265
Residence counselors ..... 30
Residential carriers, *see*: Mail carriers ..... 267
Resilient floor layers, *see*: Floor covering
  installers ..... 371
Resistance welders ..... 436
Respiratory therapy workers ..... 171
Retail trade sales workers ..... 249
Retouchers, *see*: Photographic process workers ..... 414
Riggers, *see*: Ironworkers ..... 375
Roman Catholic priests ..... 127
Roofers ..... 382
Room and desk clerks, hotel ..... 265
Rural carriers, *see*: Mail carriers ..... 267


## S


Safety engineers, *see*: Occupational safety and
  health workers ..... 41
Salary and wage administrators ..... 43
Sales occupations, *see*: Marketing and sales
  occupations ..... 235
Sales workers, *see*:
  Automobile parts counter workers ..... 237
  Automobile sales workers ..... 239
  Automobile service advisors ..... 394
  Insurance agents and brokers ..... 242
  Manufacturers' sales workers ..... 243
  Real estate agents and brokers ..... 247
  Retail trade sales workers ..... 249
  Securities sales workers ..... 250
  Wholesale trade sales workers ..... 253
Sandblasters, *see*: Forge shop occupations ..... 425
Sanitarians ..... 37
School administrators ..... 47
School counselors ..... 143
School librarians ..... 138
School nurses ..... 169
School secretaries ..... 270
School social workers ..... 119
School superintendents ..... 47
School teachers, *see*:
  College and university faculty ..... 131
  Kindergarten and elementary teachers ..... 135
  Secondary school teachers ..... 144
Science technicians ..... 223
Scientists, physical ..... 75
Seamen, *see*: Merchant marine sailors ..... 450
Second assistant engineers, *see*: Merchant marine
  officers ..... 448
Second mates, *see*: Merchant marine officers ..... 450
Secondary school teachers ..... 144
Secretaries and stenographers ..... 270
Securities sales workers ..... 250
Security officers, *see*: Guards ..... 284
Seismologists, *see*: Geophysicists ..... 82
Service advisors, *see*: Automobile repair service
  estimators ..... 394
Service observers, *see*: Telephone operators ..... 274
Service occupations ..... 279
Service sales workers, *see*: Automobile repair
  service estimators ..... 394
Service technicians, computer ..... 335
Service writers, *see*: Automobile repair service
  estimators ..... 394
Set-up workers (machine tools), *see*: Machine tool
  set-up workers ..... 429
Sewage plant operators ..... 421
Sheet-metal workers ..... 383
Sheriff's deputies ..... 286
Ships' electricians, *see*: Merchant marine sailors ..... 450
Shoe repairers ..... 416
Shorthand reporters ..... 270
Shotblasters, *see*: Forge shop occupations ..... 425
Showcase trimmers, *see*: Display workers ..... 203
Showroom models ..... 245
Singers ..... 217
Slide mounters, *see*: Photographic process workers ..... 414


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| | Page |
|---|---|
| Social and recreation workers | 119 |
| Social scientists and urban planners | 101 |
| Social scientists, social workers, religious workers, and lawyers | 97 |
| Social secretaries | 270 |
| Social workers | 119 |
| Sociologists | 115 |
| Soil conservationists | 95 |
| Solid earth geophysicists | 82 |
| Sorters, *see*: Bank clerks | 256 |
| Space or broadcast-time sales workers | 236 |
| Special agents, *see*: FBI special agents | 282 |
| Special collections librarians | 138 |
| Special librarians | 138 |
| Speech pathologists | 172 |
| Sprinkler fitters, *see*: Plumbers and pipefitters | 380 |
| Staff officers, *see*: Merchant marine officers | 447 |
| State highway patrol officers | 287 |
| State police officers | 287 |
| State troopers | 287 |
| Station installers, *see*: Telephone and PBX installers and repairers | 341 |
| Stationary engineers, *see*: Boiler tenders | 419, 423 |
| Statisticians | 71 |
| Steamfitters, *see*: Plumbers and pipefitters | 380 |
| Stenographers | 270 |
| Stewardesses | 311 |
| Stewards | 311 |
| Stonemasons | 363 |
| Stratigraphers, *see*: Geologists | 81 |
| Stripping-shovel operators, *see*: Coal mining operatives | 387 |
| Structural steelworkers | 375 |
| Student health service directors | 30 |
| Surfacers, ophthalmic laboratory technicians | 410 |
| Surgeon assistants | 167 |
| Surgical technicians | 190 |
| Surgical technologists | 190 |
| Surveyors and surveying technicians | 54 |
| Synoptic meteorologists | 83 |
| Systems analysts | 72 |
| Systems programmers, *see*: Programmers | 230 |


## T


| | Page |
|---|---|
| Tailers, *see*: Coal mining operatives | 388 |
| Teacher aides | 273 |
| Teachers, *see*: | |
| College and university faculty | 131 |
| Dancers | 000 |
| High school teachers | 144 |
| Kindergarten and elementary school teachers | 135 |
| Musicians | 215 |
| Secondary school teachers | 144 |
| Singers | 217 |
| Vocational teachers, agriculture | 315 |
| Teachers, librarians, and counselors | 129 |
| Technical illustrators | 201 |
| Technical librarians | 138 |
| Technical secretaries | 270 |
| Technical stenographers | 270 |
| Technical writers | 232 |
| Technicians, broadcasting | 221 |
| Technicians, dental laboratory | 401 |
| Technicians, engineering and science | 223 |
| Technicians, forestry | 318 |
| Technicians, medical record | 186 |
| Technicians, television and radio service | 343 |
| Technologists and technicians, except health | 219 |
| Telephone adjusters, *see*: Claim representatives | 260 |
| Telephone and PBX installers and repairers | 341 |
| Telephone answering–service operators, *see*: Telephone operators | 274 |
| Telephone installers | 341 |
| Telephone line installers and cable splicers | 338 |
| Telephone operators | 274 |
| Telephone repairers | 341 |
| Teletype operators, *see*: Bank clerks | 256 |
| Television and radio service technicians | 343 |
| Tellers, bank | 258 |
| Terminal operators, *see*: Typists | 276 |
| Terminal-system operators, *see*: Typists | 276 |
| Terrazzo workers | 366 |
| Textile designers | 202 |
| Therapeutic dietitians | 160 |
| Therapist assistants, physical | 303 |
| Therapists, educational, *see*: Kindergarten and elementary school teachers | 135 |
| Therapists, educational, *see*: Secondary school teachers | 144 |
| Therapists, inhalation | 171 |
| Therapists, occupational | 161 |
| Therapists, physical | 165 |
| Therapy assistants, occupational | 301 |
| Third assistant engineers, *see*: Merchant marine officers | 447 |
| Third mates, *see*: Merchant marine officers | 447 |
| Ticket agents, airline | 255 |
| Ticket sellers, *see*: Cashiers | 240 |
| Tilesetters | 385 |
| Tool-and-die makers | 417 |
| Tool designers, *see*: Engineering and science technicians | 223 |
| Toxicologists | 88 |
| Tracers, *see*: Drafters | 222 |
| Traffic controllers, airport | 219 |
| Training specialists, *see*: Personnel and labor relations specialists | 43 |
| Transcribing machine operators, *see*: Typists | 276 |
| Transit clerks, *see*: Bank clerks | 257 |
| Transmission engineers, *see*: Broadcast technicians | 221 |
| Transmission testers, *see*: Central office craft occupations | 331 |
| Transmitter operators, *see*: Broadcast technicians | 221 |
| Transportation and material moving occupations | 438 |
| Travel agents | 252 |
| Treatment plant operators, wastewater | 421 |
| Trimmers, forge shop | 425 |
| Troopers, *see*: State police officers | 287 |
| Trouble locators, telephone | 331 |
| Truck mechanics and bus mechanics | 328 |
| Truckdrivers, local | 442 |
| Truckdrivers, long-distance | 443 |
| Trust officers, *see*: Bank officers and managers | 25 |
| Trust securities clerks, *see*: Bank clerks | 257 |
| Tune-up mechanics, *see*: Automobile mechanics | 324 |
| Typists | 276 |


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*Page*

## U


Underwriters, insurance ..... 49
University faculty ..... 131
Upholsterers, *see*: Furniture upholsterers ..... 404
Upsetters, *see*: Forge shop occupations ..... 425
Urban geographers ..... 77
Urban and regional planners ..... 117
Urologic physician assistants ..... 167
Utility hands, *see*: Merchant marine sailors ..... 450


## V


Varitype operators, *see*: Typists ..... 276
Vehicle and mobile equipment mechanics and repairers ..... 321
Vending machine mechanics ..... 356
Verifier operators, *see*: Bank clerks ..... 256
Veterans coordinators, *see*: College student personnel workers ..... 30
Veterinarians ..... 156, 315
*See also:* Agricultural and biological scientists ..... 89
Video-control engineers, *see*: Broadcast technicians ..... 221
Video recording technicians, *see*: Broadcast technicians ..... 221
Vocational rehabilitation counselors, *see*: Rehabilitation counselors ..... 141
Vocational counselors, *see*: Employment counselors ..... 134
Vocational nurses, licensed ..... 183
Volcanologists, *see*: Geologists ..... 81


*Page*

## W


Wage-hour compliance officers ..... 36
Waiters and waitresses ..... 295
Waiters assistants and kitchen helpers ..... 296
Wastewater treatment plant operators ..... 421
Watch repairers ..... 358
Welders ..... 436
Welders, maintenance ..... 436
Welding machine operators ..... 436
Wholesale trade sales workers ..... 253
Window clerks, *see*: Postal clerks ..... 268
Window dressers, *see*: Display workers ..... 203
Wipers, *see*: Merchant marine sailors ..... 450
Wood patternmakers, *see*: Patternmakers ..... 412
Word processing supervisors, *see*: Typists ..... 276
Writers, artists, and entertainers ..... 192
Writers, technical ..... 232
*See also:* Writers and editors ..... 199


## X


X-ray technologists, radiologic ..... 188


## Y


Young adult librarians ..... 138


## Z


Zoologists, *see*: Agricultural and biological scientists ..... 88


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| 5 | Astronomers |
| 19 | Automobile body repairers |
| 19 | Automobile mechanics |
| 19 | Automobile parts counter workers |
| 19 | Automobile repair service estimators |
| 15 | Automobile sales workers |
| 19 | Automotive painters |

## B

| | |
|---|---|
| 16 | Bank clerks |
| 2 | Bank officers and managers |
| 16 | Bank tellers |
| 21 | Barbers |
| 18 | Bartenders |
| 18 | Bellhops and bell captains |
| 6 | Biochemists |
| 3 | Biomedical engineers |
| 26 | Blue-collar worker supervisors |
| 26 | Boilermaking occupations |
| 26 | Boiler tenders |
| 24 | Bookbinders and bindery workers |
| 16 | Bookkeepers and accounting clerks |
| 22 | Bricklayers and stonemasons |
| 3 or 13 | Broadcast technicians |
| 20 | Business machine repairers |
| 2 or 15 | Buyers |

## C

| | |
|---|---|
| 22 | Carpenters |
| 15 or 18 | Cashiers |
| 22 | Cement masons and terrazzo workers |
| 20 | Central office craft occupations (telephone) |
| 20 | Central office equipment installers (telephone) |
| 3 | Ceramic engineers |
| 3 | Chemical engineers |
| 5 | Chemists |
| 10 | Chiropractors |
| 7 | City managers |
| 3 | Civil engineers |
| 16 | Claim representatives |
| 16 | Collection workers |
| 9 | College and university faculty |
| 8 | College career planning and placement counselors |
| 8 | College student personnel workers |
| 13 or 14 | Commercial and graphic artists and designers |
| 24 | Compositors |
| 4 or 16 | Computer operating personnel |
| 4 or 20 | Computer service technicians |
| 17 | Construction inspectors (government) |
| 22 | Construction laborers |
| 18 | Cooks and chefs |
| 6 or 9 | Cooperative extension service workers |
| 25 | Coremakers |
| 17 | Correction officers |
| 21 | Cosmetologists |
| 2 | Credit managers |

## D

| | |
|---|---|
| 13 | Dancers |
| 11 | Dental assistants |
| 11 | Dental hygienists |
| 11 | Dental laboratory technicians |
| 10 | Dentists |
| 11 | Dietitians |
| 12 | Dispensing opticians |
| 14 | Display workers |
| 3 | Drafters |
| 23 | Drywall installers and finishers |

## E

| | |
|---|---|
| 7 | Economists |
| 12 | EEG technicians and technologists |
| 12 | EKG technicians |
| 20 | Electric sign repairers |
| 3 | Electrical engineers |
| 23 | Electricians (construction) |
| 24 | Electrotypers and stereotypers |
| 22 | Elevator constructors |
| 12 | Emergency medical technicians |
| 8 | Employment counselors |
| 3 | Engineering and science technicians |
| 3 | Engineers |

## F

| | |
|---|---|
| 19 | Farm equipment mechanics |
| 17 | FBI special agents |
| 17 | Firefighters |
| 27 | Flight attendants |
| 23 | Floor covering installers |
| 14 | Floral designers |
| 18 | Food counter workers |
| 6 | Food technologists |
| 6 | Foresters |
| 6 | Forestry technicians |
| 25 | Forge shop occupations |
| 21 | Furniture upholsterers |

## G

| | |
|---|---|
| 5 or 7 | Geographers |
| 5 | Geologists |
| 5 | Geophysicists |
| 23 | Glaziers |
| 17 | Guards |

## H

| | |
|---|---|
| 6 or 17 | Health and regulatory inspectors (government) |
| 11 | Health services administrators |
| 7 | Historians |
| 18 | Hotel front office clerks |
| 18 | Hotel housekeepers and assistants |
| 2 | Hotel managers and assistants |

## I

| | |
|---|---|
| 14 | Industrial designers |
| 3 | Industrial engineers |
| 20 or 26 | Industrial machinery repairers |
| 25 | Instrument makers |
| 23 | Insulation workers |
| 15 | Insurance agents and brokers |
| 27 | Intercity busdrivers |
| 14 | Interior designers |
| 22 | Ironworkers |

## J

| | |
|---|---|
| 21 | Jewelers |

## K

| | |
|---|---|
| 9 | Kindergarten and elementary school teachers |

## L

| | |
|---|---|
| 14 | Landscape architects |
| 7 | Lathers |
| 7 | Lawyers |
| 7 | Legal assistants |
| 9 | Librarians |
| 9 | Library technicians and assistants |
| 11 | Licensed practical nurses |
| 20 | Line installers and cable splicers |
| 24 | Lithographers |
| 27 | Local transit busdrivers |
| 27 | Local truckdrivers |
| 27 | Long-distance truckdrivers |



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## M

25 Machine tool operators
25 Machine tool setup workers
25 Machinists, all-round
16 Mail carriers
20 or 26 Maintenance electricians
15 Manufacturers' sales workers
2 or 7 Market research analysts
6 Mathematicians
18 Meatcutters
3 Mechanical engineers
12 Medical assistants
12 Medical laboratory workers
12 Medical record administrators
12 Medical record technicians and clerks
27 Merchant marine officers
27 Merchant marine sailors
3 Metallurgical engineers
5 Meteorologists
26 Millwrights
3 Mining engineers
15 Models
25 Molders
15 Musicians

## O

3 or 17 Occupational safety and health workers
11 Occupational therapists
11 Occupational therapy assistants
5 Oceanographers
22 Operating engineers (construction machinery operators)
12 Ophthalmic laboratory technicians
12 Optometric assistants
10 Optometrists
10 Osteopathic physicians

## P

23 Painters and paperhangers
25 Patternmakers
2 Personnel and labor relations specialists
3 Petroleum engineers
10 Pharmacists
24 Photoengravers
13 or 24 Photographers
24 Photographic process workers
11 Physical therapist assistants
11 Physical therapists
11 Physician assistants
10 Physicians
5 Physicists
21 Piano and organ tuners and repairers
20 Pinsetter mechanics
23 Plasterers
22 Plumbers and pipefitters
10 Podiatrists
17 Police officers
7 Political scientists
16 Postal clerks
24 Printing press operators and assistants
26 Production painters
6 Programmers
8 Protestant ministers
7 or 8 Psychologists
2 or 13 Public relations workers
2 Purchasing agents

## R

8 Rabbis
13 Radio and television announcers and newscasters
12 Radiologic (X-ray) technologists
6 Range managers
15 Real estate agents and brokers
16 Receptionists
8 Recreation workers
11 Registered nurses
8 Rehabilitation counselors
13 or 24 Reporters and correspondents
12 Respiratory therapy workers
15 Retail trade sales workers
8 Roman Catholic priests
22 Roofers

## S

9 School administrators
8 School counselors
9 Secondary school teachers
16 Secretaries and stenographers
15 Securities sales workers
23 Sheet-metal workers
21 Shoe repairers
13 Singers
8 Social workers
7 Sociologists
6 Soil conservationists
11 Speech pathologists and audiologists
17 State police officers
26 Stationary engineers
6 Statisticians
12 Surgical technicians
3 Surveyors and surveying technicians
6 Systems analysts

## T

9 or 16 Teacher aides
13 or 24 Technical writers
20 Telephone and PBX installers and repairers
16 Telephone operators
21 Television and radio service technicians
23 Tilesetters
25 Tool-and-die makers
15 Travel agents
19 Truck mechanics and bus mechanics
16 Typists

## U

2 Underwriters
14 Urban and regional planners

## V

20 Vending machine mechanics
10 Veterinarians

## W

18 Waiters and waitresses
18 Waiters' assistants and kitchen helpers
26 Wastewater treatment plant operators
21 Watch repairers
25 Welders and flamecutters
15 Wholesale trade sales workers
13 or 24 Writers and editors

102 1



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