

Occupational Outlook Handbook, 1980-81 Edition



U.S. Department of Labor
Bureau of Labor Statistics
March 1980

Publication 2075



Heard about our
new
publications?
Exploring Careers
Counselor's Guide to Occupational Information
Turn to page 653
to find out about these and other BLS publications useful to Handbook readers.

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Pointers on Using the Handbook

- **To locate a particular occupation or industry, see:**
Contents, page viii.
Index to Occupations and Industries, page 635.
- **Occupations have new code numbers.**
This is the first *Handbook* to use the codes from the new 4th edition of the *Dictionary of Occupational Titles*. The Index to the *Dictionary of Occupational Titles*, on page 626, lists nearly 1,000 occupations by D.O.T. code and title and, for each, refers you to the relevant page of the *Handbook*.
- **How do economists forecast the future?**
For a brief description of the assumptions and methods used in preparing BLS employment projections, see page 24.
- **For an overview of job prospects to 1990,**
read the section on Tomorrow's Jobs starting on page 16 .
- **Should you steer clear of a slow-growing occupation?**
For pointers on interpreting the outlook section that appears in every *Handbook* statement, see page 4 .
- **Need more career information?**
Consult the Sources of Additional Information at the end of every statement. See page 8 for other places to look for information on occupations and careers.

Occupational Outlook Handbook, 1980-81 Edition



U.S. Department of Labor
Ray Marshall, Secretary

Bureau of Labor Statistics
Janet L. Norwood, Commissioner
March 1980

Bulletin 2075

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Foreword

Ray Marshall,
Secretary of Labor

The difficulties many young people experience when making the transition from school to work have been recognized as a serious national problem. But the process of choosing and preparing for a career is no easier for persons who seek a career change or who enter the labor force at later stages in their lives. Selecting a career can be accompanied by anxiety and uncertainty regardless of when the decision is made.

Accurate and comprehensive career guidance may ease the anxiety. In this way, one can become aware of available opportunities and alternatives, and can plan for a career that matches one's abilities and aspirations.

The *Occupational Outlook Handbook*, a major source of vocational guidance information, describes what workers do on the job; the training and education they need; earnings; working conditions; and expected job prospects for hundreds of occupations. It is our hope that this publication will continue to offer valuable help to everyone seeking satisfying and productive employment.

Prefatory Note

Janet L. Norwood,
Commissioner,
Bureau of Labor Statistics

In our constantly changing economy, information on tomorrow's career opportunities must be available if workers are to be prepared for the future. Since 1945, 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, the *Handbook* contains a description of job duties, education and training requirements, employment outlook, earnings, and working conditions for several hundred occupations and 35 industries. *Handbook* information is based on data received from a variety of sources, including business firms, trade associations, labor unions, professional societies, educational institutions, and government agencies.

For the first time, the *Handbook* includes in each occupational statement a section listing other occupations that require similar aptitudes, interests, or education and training. The *Handbook* also contains an index referenced to the most recent edition of the *Dictionary of Occupational Titles*.

Letter of Endorsement

Dr. Mary F. Maples, President
American Personnel and
Guidance Association

William B. Lewis
Administrator
U.S. Employment Service
U.S. Department of Labor

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Alvin Tucker
Director for Training and Education
U.S. Department of Defense

Choosing a career is one of life's most important decisions. A wise choice can yield pride of achievement, an opportunity for personal growth, and the security of an adequate income. An unwise choice can lead to dissatisfaction not only with the job but also with oneself. Precisely what is a wise choice depends, of course, on the individual. Not everyone is attracted by or suited to the same type of work, and frequently a person's job needs and aspirations change over time. Because deciding on a career, whether for the first or the fifteenth time, can be difficult, the advice of a trained counselor can help a great deal.

To assist individuals in finding a fulfilling career, counselors must have current, accurate, and comprehensive occupational information. The *Occupational Outlook Handbook* is a primary source of this information. For several hundred occupations and 35 major industries, the *Handbook* describes what workers do on the job, their working conditions, the training and education required, advancement possibilities, employment outlook, and earnings. To broaden the reader's awareness of career options, each occupational statement also lists related occupations and gives sources of additional information.

Counselors in all work settings will find this newest edition of the *Handbook* an invaluable tool for helping clients choose a satisfying and rewarding career.

Contributors

The *Handbook* was prepared in the Bureau of Labor Statistics, Division of Occupational Outlook, under the supervision of Neal H. Rosenthal.

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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 the statements on individual occupations and industries. 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 industries 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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Guide to the Handbook

How to Use the Handbook

**Where to Go for More
Information**

Tomorrow's Jobs

**Assumptions and Methods
Used in Preparing
the Employment Projections**

HOW TO USE THE HANDBOOK

As the economy grows and as new technologies and ways of doing business are developed, the variety of careers from which to choose increases. According to the *Dictionary of Occupational Titles*, there currently are more than 20,000 separate jobs in our economy. But most of us are familiar with only a few of these, usually the occupations of people we know or the characters we see on television or in films. Since choosing a career is one of the most important decisions a person can make, you should take some time to explore the possibilities fully before you make a selection. You may be surprised to discover that a job you never heard of, or never seriously considered seems right for you. Or, you may find that the career you now have in mind still seems like a good choice, and you can make your plans more confidently.

One way to begin studying about careers is to look through the *Occupational Outlook Handbook*. This part of the *Handbook* describes the information presented in the *Handbook* and offers some useful hints on how to use it to help you find the right career.

Where do I start?

Like a dictionary, encyclopedia, or other reference book, the *Handbook* has no beginning or ending point. You can simply look through the table of contents or index, find the occupation you are interested in, and read those sections. If you want to know more about the working world, read the section on Tomorrow's Jobs first. 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 think about planning for a career, you may wonder what things you should consider. Start with what you know about your own interests and abilities. 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? The answers to these and similar questions can help you discover your own characteristics. Understanding something about yourself is important because your traits, abilities, and goals will largely determine whether you will like working in a particular job and if, in fact, you can do that job well. Your school counselor or another professional trained in human behavior can help you ask yourself the right questions. Talking with your family and friends can help you learn about yourself, too.

Once you have decided what your interests

are, look in the *Handbook's* table of contents to find occupations that appear to match your interests. All of the occupations in the *Handbook* are grouped in 13 clusters of related jobs. Thus, if you find that you enjoy building things, you might start by looking at occupations in the cluster on construction occupations. Or, if you want to make helping other people your life's work, you might look at occupations in the social service cluster. The 13 occupational clusters are:

- Industrial production
- Office
- Service
- Education
- Sales
- Construction
- Transportation
- Scientific and technical
- Mechanics and repairers
- Health
- Social science
- Social service
- Performing arts, design, and communications

In addition to individual occupations, the *Handbook* also includes descriptions of the work in several industries. If you are interested in an industry, or if an industry is a major employer in your area, you may find it useful to read the section on that industry. From it, you will learn about the jobs found in the industry and their training requirements and earnings potential. A total of 35 industries are described in the *Handbook*, grouped according to major divisions in the economy.

To find the industry you are interested in, turn to the alphabetical Index to Occupations and Industries at the back of the book.

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, training required, physical demands, and working conditions. *D.O.T.* numbers are used by public employment service agencies for classifying 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 in the back of the *Handbook*, just before the alphabetical index.

What will I learn?

Once you have chosen a place to begin—an occupation or industry you'd like to learn more about—you can use the *Handbook* to find out what the job is like, what education and training are needed; what the advancement possibilities, earnings, and employment outlook are likely to be; and also related occupations you might want to explore. Each section of the *Handbook* follows a standard format, making it easier to compare different jobs. What follows is a description of the type of information presented in each occupation or industry section of the *Handbook*, with some hints on how to use this information.

The Nature of the Work section describes the major duties of workers in the occupation or industry. It tells what workers do on the job, what tools or equipment they use, and how they do their work. Although the descriptions are typical of each job, there are many occupations where the work varies with the size or type of employer. For example, a registered nurse who works in an elementary school will spend more time treating minor injuries and soothing children's feelings than one who works in a hospital. There also are many fields of work that contain specialties; teaching and medicine are good examples.

An important part in your career decision will probably be whether the work done on the job appeals to you, so try to find out as much as possible about work in those occupations which interest you. The next chapter of the *Handbook*—Where to Go for More Information—suggests ways to learn more about jobs. You also can look for more information in your school library or counseling center. If you and your counselor can arrange it, talk to someone who works in the occupation or, even better, watch them on the job.

Working conditions also are very important to consider when finding a career that appeals to you. Some people, for example, like outdoor work because of the chance to enjoy beautiful weather and the freedom that often goes with this type of job. Others like to work in an office to avoid bad weather and, usually, noise and dirt, too. A list of working conditions common to different occupations in the *Handbook* follows. Since those you feel strongly about, whether you like or dislike them, can make a job more or less attractive, you should consider them when making your decision.

Overtime work. When overtime is required on a job, employees must give up some of their free time and be flexible in their personal lives. Usually, however, overtime does

offer added income or a chance to earn extra days off.

Shift work. 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: Bus-drivers, for example, may work morning and evening rush hours with time off in the middle of the day. Some people prefer shift work because they can pursue leisure activities or take care of errands during daytime hours.

Environment. 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.

Outdoor work. 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.

Hazards. 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.

Physical demands. Some jobs require standing, crouching in awkward positions, heavy lifting, or are otherwise strenuous. Be sure you have the physical strength and stamina the work you are interested in requires.

The Places of Employment section provides information on the number of workers in an occupation and tells whether they are concentrated in certain industries or geographic areas. The size of an occupation is important to a jobseeker because large occupations, even those growing slowly, offer more openings than small ones as many workers retire or die each year.

Some occupations, such as cooks and chefs, are concentrated in particular industries. Other occupations, such as secretaries, are found in almost every industry. If an occupation is found primarily in certain industries, this section lists them.

A few occupations are concentrated in certain parts of the country. Actors and actresses, for example, usually work in California or New York. This information is included for the benefit of people who have strong preferences about where they live. For most occupations, however, employment is widely scattered and generally follows the same pattern as the distribution of the population.

In addition, information on part-time employment is included because it is important to 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.

The Training, Other Qualifications, and Advancement 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 list of 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 post-secondary 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 which way is preferred. In many cases, alternative ways of obtaining training are listed as well. It is worth remembering that the level at which you enter an occupation and the speed with which you advance often are determined by the amount of training you have.

Certain occupations offer employment opportunities to persons who have little or no previous work experience. Many of these are included in the *Handbook*. Although such jobs generally are found in the office and service clusters, some are also found in the sales, mechanic, and industrial production clusters.

Many occupations are natural stepping stones to others. After working for a time as a computer programmer, for example, many people advance to jobs as systems analysts. The world of work is constantly changing and fewer people spend their lives in one or even two occupations. 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 from one occupation to another exists, it is discussed in this portion of each *Handbook* chapter.

Information on occupational mobility can be useful in several ways. It is helpful to know, for example, that 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 scope for self-expression. On the other hand, it also is useful to know which jobs offer the most opportunity 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.

In some cases, moving from one occupation to another takes more than the training or experience acquired on the job. For exam-

ple, 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 in-service programs that allow employees to gain needed skills while continuing to work part time.

It usually is wise to discuss the patterns of job transfer and advancement described in the *Handbook* with counselors, local employers, and others who know about the particular job market where you want to work. The average patterns of movement from one occupation to another may not exist in every industry or area.

One more factor you must consider is that all States have certification or licensing requirements for some occupations. Physicians and nurses, elementary and secondary school teachers, barbers and cosmetologists, and electricians and plumbers are examples of workers who must be licensed. If you are considering an occupation that is licensed, be sure to check the requirements in the State in which you plan to work because a license from one State may not be valid in another. Common requirements for a license include completion of a State-approved training or educational program and a passing grade on a written test.

A very important item to consider when making a career choice is the extent to which a particular job matches your personality. Although it often is difficult for people to assess themselves, your counselor undoubtedly is familiar with tests that can help you learn about yourself. For each occupation described in the *Handbook*, information is provided which allows you to match your own unique personal characteristics—your likes and dislikes—with the characteristics of the job. A particular job could require a person who is able to do one or more of the following:

- make responsible decisions.
- motivate others.
- direct and supervise others.
- work in a highly competitive atmosphere.
- enjoy working with ideas and solving problems.
- enjoy working with people.
- enjoy working with tools or machinery—good coordination and manual dexterity are necessary.
- work independently—initiative and self-discipline are necessary.
- work as part of a team.
- enjoy working with detail, either numbers or technical written material.
- enjoy helping people.
- use creative talents and ideas and enjoy having an opportunity for self-expression.
- derive satisfaction from seeing the physical results of your work.
- work in a confined area.
- perform repetitious work.
- enjoy working outside, regardless of the weather.

Most jobs require some combination of these characteristics.

The Employment Outlook section discusses prospective job opportunities. Know-

ing whether or not the job market is likely to be favorable is quite important in deciding whether to pursue a specific career. 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.

In most cases, the description of employment outlook for an occupation or industry begins with a sentence about the expected change in employment through the 1980's. The occupation or industry is described as likely to grow about as fast as, faster than, or slower than the average for all occupations or industries (figure I). Job opportunities in a particular occupation or industry usually are favorable if employment is expected to increase at least as rapidly as for the economy as a whole. Occupations or industries in which employment is likely to stay about the same or to decline generally offer less favorable job prospects. In some cases, a statement is made about the effect fluctuations in economic activity have on employment in the occupation or industry. This information is valuable to people looking into long-range career possibilities at a time when the economy is in a recession. People 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 from now than it is today? The *Handbook* gives information, wherever feasible, on occupations and industries whose levels of employment fluctuate in response to shifts in the economic climate. It is important to bear in mind that employment in many—but not all—occupations and industries is directly affected by an economic downturn. A sharp improvement in the outlook for these occupations and industries is likely as the economy picks up. However, other occupations and industries are less vulnerable to short-term changes in economic activity. Their growth or decline is influenced by other factors discussed in this section.

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

Figure II

Job opportunities

- Excellent
- Very good
- Good or favorable
- May face competition
- Keen competition

Prospective demand-supply relationship

- Demand much greater than supply
- Demand greater than supply
- Rough balance between demand and supply
- Likelihood of more supply than demand
- Supply greater than demand

of workers is likely to exceed the demand for them. The precise terms used in the *Handbook* are shown in figure II.

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 for workers because their leaving usually creates job openings. Although the information currently available on transfers among occupations is limited, the *Handbook* describes transfer patterns and their effect on the supply of workers for certain occupations. The employment outlook for engineers, for example, notes that transfers into the field are likely to constitute a substantial portion of supply, if past trends continue.

The information in the employment outlook section should be used carefully, however. The prospect of relatively few openings, or of strong competition, 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. Getting a job may be difficult if the field is so small that openings are few (actuaries and blacksmiths are examples) or so popular that it attracts many more jobseekers than there are jobs (radio and television broadcasting, journalism, the performing arts, and modeling). Getting a job also can be difficult in occupations and industries in which employment is declining (merchant sailors, photoengravers, typesetters), although this is not always the case.

Remember, even occupations that are small or overcrowded provide some jobs. So do occupations in which employment is growing very slowly or even declining, for there is a need to replace workers who leave the occupation. If the occupation is large, the number of job openings arising from replacement needs can be quite substantial. Bookkeepers, telephone operators, and machinists are examples of large occupations that pro-

vide a significant number of job openings each year because 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.

In other words, *don't* rule out a potentially rewarding career simply because the prospective outlook in an occupation is not favorable. *Do* discuss your abilities and aptitudes with your counselor. Getting more information is a good idea, too—look at the section on Where to Go for More Information for suggested ways to find out more about job outlook.

How reliable is the information on the outlook for employment over the next 10 years? No one can predict future labor market conditions with perfect accuracy. In every occupation and industry, the number of jobseekers and the number of 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, or retirement programs determine the number of workers available. As these forces interact in the labor market, some occupations experience a shortage of workers, some a surplus, 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. Therefore, it is important to understand what underlies each statement on employment outlook.

For every occupation and industry 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 a more detailed explanation of how these projections are developed, see the section entitled, Assumptions and Methods Used In Preparing the Employment Projections.

Finally, you should remember that job prospects in your community or State may not correspond to the description of the employment 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 and

Figure I

| Description | Projected 1978-90 change in employment requirements |
|---|---|
| Much faster than the average for all occupations | 50.0 percent or more |
| Faster than the average for all occupations | 25.0 to 49.9 percent |
| About as fast as the average for all occupations ¹ | 15.0 to 24.9 percent |
| More slowly than the average for all occupations | 5.0 to 14.9 percent |
| Little change is expected | 4.9 to -4.9 percent |
| Expected to decline | -5.0 percent or more |

¹The average increase projected for all occupations for the 1978-90 period is 20.8 percent.

area employment projections. Names and addresses of these State and local information sources and suggestions for additional information on the job market are given in the following section, Where to Go for More Information.

The Earnings 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?

Like most people, you probably think of earnings as money—a paycheck in the bank or cash in the pocket. But money is only one type of financial reward for work. Paid vacations, health insurance, uniforms, and discounts on clothing or other merchandise also are part of total earnings.

For about 9 out of 10 workers, money income is received in the form of a *wage or salary*. A wage usually is an hourly or daily rate of pay, while a salary is a weekly, monthly, or yearly rate. Most craft workers, operatives, and laborers are wage earners, while most professional, technical, and clerical workers are salary earners.

In addition to their regular pay, wage and salary workers may receive extra money for working overtime. Those who work on a night shift or who work irregular hours receive extra pay called a shift differential. Workers in some occupations, such as parking attendants or waiters and waitresses, also receive tips based on the services they provide customers. Automobile sales workers and real estate agents are among those who are paid a commission—a percent of the amount they sell. Factory workers are sometimes paid a piece rate, which is an extra payment for each item they produce. For many workers, these types of pay amount to a large part of their total earnings.

The remaining 10 percent of all workers are in business for themselves and earn *self-employment income* instead of wages or salaries. This group includes workers in a wide variety of occupations: Physicians, shopkeepers, barbers, writers, photographers, and farmers are examples of workers who frequently are self-employed.

Some occupations may offer workers 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 publish articles based on independent research.

Besides money income, most wage and salary workers receive a variety of *fringe benefits* as part of their earnings on the job. Several are required by Federal and State law, including social security, workers' compensation, and unemployment insurance. These benefits provide income to persons

Table 1. Career ladder of drafters

| | Average annual earnings |
|--------------------------------|-------------------------|
| Tracers (beginners) | \$ 9,800 |
| Experienced drafters | 11,200–13,700 |
| Senior drafters | 16,900 |

SOURCE: Bureau of Labor Statistics.

when they are not working because of old age, work-related injury or disability, or lack of suitable jobs.

Among the most common fringe benefits are paid vacations, holidays, and sick leave. In addition, many workers are covered by life, health, and accident insurance; participate in retirement plans; and are entitled to supplemental unemployment benefits. All of these benefits are provided—in part or in full—through their employers. Some employers also offer stock options and profit-sharing plans, savings 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. Workers in other jobs may receive uniforms, business expense accounts, or free transportation on company-owned planes.

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 1978.

Besides differences among occupations, many levels of pay exist within each occupation. Beginning workers almost always earn less than those who have been on the job for some time because pay rates increase as workers gain experience or do more responsible work. An example is shown in table 1.

Earnings in an occupation also vary by geographic location. The average weekly earnings of beginning computer programmers, for example, vary considerably from city to city. (See table 2.) 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 those cities which offer the highest earnings are often those in which it is most expensive to live.

In addition, workers in the same occupation may have different earnings depending on the industry in which they work. For example, senior accounting clerks in 1978 averaged \$253.52 a week in public utilities, \$213.38 a week in manufacturing, \$202.82 a week in wholesale trade, and \$196.48 a week in retail trade, but only \$190.14 in services and \$185.92 in finance, insurance, and real estate.

Salaries also vary by the specialty or type of work performed. Surgeons, for example, earn more on the average than pediatricians

Table 2. Average weekly earnings of beginning computer programmers, 1978, selected cities

| City | Average weekly earnings |
|--------------------------------|-------------------------|
| Detroit | \$283.00 |
| Milwaukee | 282.00 |
| Cleveland | 260.50 |
| Chicago | 260.00 |
| Houston | 257.50 |
| Newark | 254.50 |
| Minneapolis–St. Paul | 241.50 |
| Baltimore | 234.00 |
| Birmingham | 228.50 |
| Boston | 210.50 |

SOURCE: Bureau of Labor Statistics.

Table 3. Median annual earnings of private physicians, 1977, by specialty

| Specialty | Earnings |
|---------------------------------|----------|
| Orthopedic surgeons | \$91,940 |
| General surgeons | 68,720 |
| Pediatricians | 54,180 |
| General practitioners | 51,000 |

SOURCE: *Medical Economics*. After tax-deductible expenses but before income taxes.

or general practitioners. (See table 3.) Also, in most occupations, workers who become supervisors or managers earn more than their fellow workers.

Because of all these variations in earnings, you should check with a counselor or with

local employers if you are interested in specific earnings information for occupations in your area.

The Related Occupations section is appearing for the first time in this edition of the *Handbook*. 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.

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 a wealth of occupational information available at little or no cost.

Sources of Career Information

Government agencies, professional societies, trade associations, labor unions, corporations, and educational institutions put out career material that is available for the asking. Write to organizations listed in the Sources of Additional Information section at the end of every *Handbook* statement and ask for information on career opportunities. You will find the names and addresses of other organizations that publish career information in directories in your library's reference section. There are directories that list:

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

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

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 infor-

mation. 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 have recently been established. These committees can help you find career information tailored to 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 is a list of their titles and addresses:

Alabama

Director, Alabama Occupational Information Coordinating Committee, State Department of Education,
First Southern Towers, Suite 402,
100 Commerce St.,
Montgomery, Ala. 36104.

Alaska

Coordinator, Alaska Occupational Information Coordinating Committee,
Pouch F—State Office Bldg.,
Juneau, Alaska 99811.

Arizona

Executive Director, Arizona State Occupational Information Coordinating Committee,
1535 West Jefferson Ave., Room 345,
Phoenix, Ariz. 85007.

Arkansas

Director, Arkansas State Occupational Information Coordinating Committee,
P.O. Box 5162,
Little Rock, Ark. 72205.

California

Director, California Occupational Information Coordinating Committee,
535 East Main St.,
Ventura, Calif. 93009.

Colorado

SOICC Director, Office of Occupational Information, Colorado Occupational Information Coordinating Committee,
770 Grant St.,
Room 222,
Denver, Colo. 80203.

Connecticut

Executive Director, Connecticut State Occupational Information Coordinating Committee,
Hartranft Hall,
55 Elizabeth St.,
Hartford, Conn. 06053.

Delaware

Director, State Occupational Information Coordinating Committee of Delaware,
820 North French St.,
6th floor,
Wilmington, Del. 19801.

District of Columbia

Executive Director, D.C. Occupational Information Coordinating Committee,
500 C St. NW., Suite 621,
Washington, D.C. 20001.

Florida

Director, Florida Occupational Information Coordinating Committee,
325 John Knox Rd.,
Suite L-500,
Tallahassee, Fla. 32303.

Georgia

Executive Director, State Occupational Information Coordinating Committee,
151 Ellis St., NE.,
Suite 504,
Atlanta, Ga. 30303.

Hawaii

Executive Director, Hawaii State Occupational Information Coordinating Committee,
1164 Bishop St.,
Suite 502,
Honolulu, Hawaii 96813.

Idaho

Coordinator, State Occupational Information Coordinating Committee, Len B. Jordan Bldg.,
650 W. State St.,
Boise, Idaho 83720.

Illinois

Executive Director, Illinois Occupational Information Coordinating Committee,
623 E. Adams St.,
P.O. Box 1587,
Springfield, Ill. 62705.

Indiana

SOICC Contact, Indiana Office of Manpower Development,
State Board of Vocational and Technical Education,
17 W. Market St.,
401 Illinois Bldg.,
Indianapolis, Ind. 46204.

Iowa

Executive Director, Iowa State Occupational Information Coordinating Committee,
523 E. 12th St.,
Des Moines, Iowa 50319.

Kansas

Director, Kansas Occupational Information Coordinating Committee,
Department of Human Resources,
634 S. Harrison,
Suite C,
Topeka, Kans. 66603.

Kentucky

Coordinator, Kentucky Occupational Information Coordinating Committee,
103 Bridge St.,
Frankfort, Ky. 40601.

Louisiana

Director, Louisiana State Occupational Information Coordinating Committee,
P.O. Box 44094,
Baton Rouge, La. 70804.

Maine

Executive Director, State Occupational Information Coordinating Committee,
State House Station 71,
Augusta, Maine 04330.

Maryland

Executive Director, Maryland Occupational Information Coordinating Committee,
Department of Human Resources,
1100 North Eutaw St.,
Baltimore, Md. 21201.

Massachusetts

Executive Director, Massachusetts Occupational Information Coordinating Committee,
Park Square Bldg.,
Suite 341,
31 St. James Ave.,
Boston, Mass. 02116.

Michigan

Executive Coordinator, Michigan Occupational Information Coordinating Committee,
309 N. Washington, P.O. Box 30015,
Lansing, Mich. 48909.

Minnesota

SOICC Director, Department of Economic Security,
690 American Center Bldg.,
150 E. Kellogg Blvd.,
St. Paul, Minn. 55101.

Mississippi

SOICC Director, Vocational Technical Education,
P.O. Box 771,
Jackson, Miss. 39205.

Missouri

Director, Missouri Occupational Information Coordinating Committee,
8300 E. High St.,
Jefferson City, Mo. 65101.

Montana

Program Manager, Montana State Occupational Information Coordinating Committee,
P.O. Box 1728,
Helena, Mont. 59601.

Nebraska

Executive Director, State Occupational Information Coordinating Committee,
W. 300 Nebraska Hall,
University of Nebraska,
Lincoln, Nebr. 68588.

Nevada

Director, State Occupational Information Coordinating Committee,
Capitol Complex,
505 E. King St.,
Kinkead Bldg.,
Room 603,
Carson City, Nev. 89710.

New Hampshire

SOICC Director, Department of Employment Security,
32 S. Main St.,
Concord, N.H. 03301.

New Jersey

Acting Staff Director, New Jersey Occupational Information Coordinating Committee,
Department of Labor and Industry, Division of Planning and Research,
P.O. Box 2765,
Trenton, N.J. 08625.

New Mexico

SOICC Director, New Mexico State Occupational Information Coordinating Committee,
Suite C, Harvey Building,
839 Paseo de Peralta,
Santa Fe, N.M. 87501.

New York

SOICC Director, State Department of Labor,
Labor Department Bldg. #12,
State Campus,
Albany, N.Y. 12240.

North Carolina

SOICC Director, North Carolina Department of Administration,
112 W. Lane St.,
Raleigh, N.C. 27611.

North Dakota

State Director, State Occupational Information Coordinating Committee,
1424 W. Century Ave.,
P.O. Box 1537,
Bismarck, N. Dak. 58501.

Ohio

SOICC Director, State Department Bldg.,
S-65 S. Front St., Room 904,
Columbus, Ohio 43215.

Oklahoma

Executive Director, State Occupational Information Coordinating Committee, School of Occupational and Adult Education, Oklahoma State University, 1515 W. 6th St., Stillwater, Okla. 74074.

Oregon

Executive Secretary, Oregon Occupational Information Coordinating Committee, 875 Union St. NE., Salem, Oreg. 97311.

Pennsylvania

SOICC Director, Pennsylvania Occupational Information Coordinating Committee, Labor and Industry Bldg., 7th and Forster Sts., Room 1008, Harrisburg, Pa. 17121.

Puerto Rico

Executive Director, Puerto Rico Occupational Information Coordinating Committee, 414 Barbosa Ave., Hato Rey, P.R. 00917.

Rhode Island

Executive Director, Rhode Island Occupational Information Coordinating Committee, 22 Hayes St., Room 315, Providence, R.I. 02908.

South Carolina

SOICC Director, 1550 Gadsden St., Columbia, S.C. 29202.

South Dakota

Executive Director, South Dakota Occupational Information Coordinating Committee, 108 E. Missouri, Pierre, S. Dak. 57501.

Tennessee

Director, Tennessee Occupational Information Coordinating Committee, 512 Cordell Hull Bldg., Nashville, Tenn. 37219.

Texas

Executive Director, State Occupational Information Coordinating Committee, Texas Employment Commission Bldg., 15th and Congress Ave., Room 648, Austin, Tex. 78778.

Utah

Director, Occupational Information Coordinating Committee, State Board of Education, 250 E. 5th St. South, Salt Lake City, Utah 84111.

Vermont

Director, Vermont Occupational Information Coordinating Committee, P.O. Box 488, Montpelier, Vt. 05602.

Virginia

SOICC Director, Vocational and Adult Education, Department of Education, P.O. Box 6Q, Richmond, Va. 23216.

Washington

SOICC Director, Commission for Vocational Education, Bldg. 17, Airdustrial Park, Mail Stop LS-10, Olympia, Wash. 98504.

West Virginia

Executive Director, West Virginia State Occupational Information Coordinating Committee, Capitol Complex, Bldg. #6, Room 221, Charleston, W. Va. 25305.

Wisconsin

SOICC Director, Wisconsin Occupational Information Coordinating Committee, Educational Sciences Building, Room 952, 1025 W. Johnson, Madison, Wis. 53706.

Wyoming

Director, Wyoming Occupational Information Coordinating Committee, 1520 E. 5th St., Cheyenne, Wyo. 82002.

American Samoa

SOICC State Director for Vocational Education, Government of American Samoa, Pago Pago, American Samoa 96799.

Guam

Acting Executive Director, Guam Occupational Information Coordinating Committee, P.O. Box 2817, Agana, Guam 96910.

Northern Mariana Islands

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

Trust Territory of the Pacific

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

Virgin Islands

Acting Chairman, Virgin Islands Occupational Information Coordinating Committee, Department of Education, Charlotte Amalie, St. Thomas, Virgin Islands 00801.

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—nursing, interior design, or operations research, for example. Whenever possible, the Sources of Addi-

tional 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 to the director of the State occupational information coordinating committee at the address listed above.

A number of standard guides give pertinent information on expenses, student financial aid, admissions requirements, and courses of study at most of the Nation's **community and junior colleges and colleges and universities**. These 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.

Directory of Postsecondary Schools with Occupational Programs, 1978, a publication of the U.S. Department of Education's National Center for Education Statistics, lists approximately 9,500 schools that offer training after high school. The directory lists **business, trade, and technical schools** as well as community and junior colleges and colleges and universities. A companion volume, *Programs and Schools, A Supplement to the Directory of Postsecondary Schools with Occupational Programs, 1978*, is particularly useful to students who are exploring alternatives to a college education. It gives the names and addresses of all accredited noncollegiate schools in the country that teach a particular skill or trade—automotive mechanics, cosmetology, or radio and television repair, for example.

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.

Sources of Financial Aid Information

If possible, consult a high school guidance counselor or college financial aid officer for 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 many directories and guides to sources of student financial aid which are updated and revised periodically and are generally available in guidance offices and public libraries. Many career information systems also provide information on financial aid.

The Federal Government provides several kinds of financial assistance to needy students: Grants, loans, work-study, and benefits. Details are presented in a pamphlet entitled, *Student Consumer's Guide; Six Federal Financial Aid Programs, 1979-80*. This pamphlet is frequently revised; request the current edition from:

Bureau of Student Financial Assistance, Post Office Box 84, Washington, D.C. 20044.

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 aids for minorities and women. Opportunities for financial aid are listed by fields 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 1979 edition is \$3.75.

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 job market disadvantages 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. Pro-

grams are sponsored by a variety of organizations, including churches and synagogues, nonprofit organizations, social service agencies, vocational rehabilitation agencies, and the Job Service. Some of the most successful programs provide the extensive counseling that disadvantaged job-seekers 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 1979-80 edition is available for \$6 from IACS at Two Skyline Place, Suite 400, 5203 Leesburg Pike, Falls Church, Va. 22041.

A directory of 140 women's employment programs, entitled *The National Directory of Women's Employment Programs*, was published in 1979 by Wider Opportunities for Women, a nonprofit organization. You might look for it in a library, or it can be purchased for \$7.50 plus 40 cents postage from Wider Opportunities for Women, 1649 K St., NW., Washington, D.C. 20006.

A revised edition of *Directory of Organizations Interested in the Handicapped* is scheduled for publication in 1980. The *Directory* lists more than 100 voluntary and public agencies in the rehabilitation field and briefly describes their purpose, programs, and publications. Copies of the *Directory* may be obtained from the People to People Committee for the Handicapped, 1522 K St. NW., Room 1130, Washington, D.C. 20005

Career counseling and job placement services for older workers are listed in *Finding a Job: A Resource Book for the Middle-Aged and Retired*, published in 1978 by Adelphi University. The book is out of print, but copies may be available in libraries and counseling centers.

Career materials tailored to the needs of women, handicapped workers, ex-offenders, and other special groups are generally available in counseling centers and libraries. State vocational rehabilitation agencies are an important source of career and counseling information for people with disabilities. 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:

Youth

Office of Information, Inquiries Unit, Employment and Training Administration, U.S. Department of Labor, Room 10225, 601 D St. NW., Washington, D.C. 20213.

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.

Minorities

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.

Higher Education Scholarship Program, Division of Postsecondary Education, Bureau of Indian Affairs, U.S. Department of the Interior, 1951 Constitution Ave. NW., Washington, D.C. 20245.

Handicapped

President's Committee on Employment of the Handicapped, Room 600, Vanguard Building, 1111 20th St. NW., Washington, D.C. 20036.

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

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.

Rehabilitation Services Administration, U.S. Department of Education, Room 1427, 330 C St. SW., Washington, D.C. 20201.

Office of Personnel Management, Federal Job Information Center, P.O. Box 52, Washington, D.C. 20044.

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.

National Clearinghouse on Aging, U.S. Department of Health and Human Services, Room 4551, 330 Independence Ave., SW., Washington, D.C. 20201.

Women

Women's Bureau, U.S. Department of Labor, Room S3002, 200 Constitution Ave. NW., Washington, D.C. 20210.

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.

Office of Personnel Management, Federal Job Information Center, P.O. Box 52, Washington, D.C. 20044.

Department of Veterans Benefits, 232A, Veterans Administration Central Office, 810 Vermont Avenue, NW., Washington, D.C. 20420.

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 public sectors, Federal contractors, and grantees are covered by these laws. The

U.S. Equal Employment Opportunity Commission is responsible for administering many of the programs that prohibit discrimination in employment. Information and inquiries about how to file a charge of discrimination should be sent to:

Equal Employment Opportunity Commission,
2401 E ST. NW., Washington, D.C. 20506.

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. Job-seekers 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 than 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 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. Each year, local Job Service centers conduct a Summer Youth Program to provide full and part-time summer jobs for youth age 14 through 21. The program, which gives priority to disadvantaged youth, arranges for jobs in schools, libraries, community service organizations, hospitals, and private nonprofit agencies. The Job Service also refers applicants to job and training opportunities under the Comprehensive Employment and Training Act (CETA); Youth Conservation Corps (YCC); National Alliance of Business (NAB); and other Federal and community programs concentrating on youth employment.

Occupations in Demand. A monthly publication of the U.S. Employment Service 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 copies from:

Consumer Information Center, Pueblo, Colorado 81009.

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 program-

mer. 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, the elderly, youth, minorities, or ex-offenders, 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. The U.S. Department of Labor is another possible source of information, for many of these agencies receive some or all of their funding from the Federal government, through the Comprehensive Employment and Training Act (CETA). Among its many and varied provisions, CETA authorizes Federal money for local organizations that offer job counseling, training, and placement help to unemployed and disadvantaged persons. For further information, write:

Office of Comprehensive Employment Development, Employment and Training Administration, U.S. Department of Labor, Room 6000, 601 D Street, NW., Washington, D.C., 20213.

College career planning and placement offices. For those who have access to them, career planning and placement offices at colleges and universities offer the jobseeker many valuable services. Like community agencies that offer supportive services to disadvantaged jobseekers, college placement offices function as more than just employment agencies. In addition to counseling, they teach students to acquire jobseeking

skills. They emphasize writing resumes and letters of application, listing possible employers, 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 State employment security agencies develop detailed labor market data needed by employment and training specialists and educators who plan for local needs. Such information helps policymakers decide whether to expand a vocational training program, for example—or drop it altogether. Jobseekers and counselors also may find these studies helpful. 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 and addresses are as follows:

Alabama

Chief, Research and Statistics, Department of Industrial Relations, Industrial Relations Bldg., 649 Monroe St., Montgomery, Ala. 36130.

Alaska

Chief, Research and Analysis, Employment Security Division, Department of Labor, P.O. Box 3-7000, Juneau, Alaska 99802.

Arizona

Chief, Labor Market Information, Research and Analysis, Department of Economic Security, P.O. Box 6123, Phoenix, Ariz. 85005.

Arkansas

Chief, Research and Statistics, Employment Security Division, P.O. Box 2981, Little Rock, Ark. 72203.

California

Chief, Employment Data and Research Division, Employment Development Department, P.O. Box 1679, Sacramento, Calif. 95808.

Colorado

Chief, Research and Analysis, Division of Employment, Department of Labor and Employment, 1210 Sherman St., Denver, Colo. 80203.

Connecticut

Director, Research and Information, Connecticut Employment Security Division, 200 Folly Brook Blvd., Weatherfield, Conn. 06109.

Delaware

Chief, Office of Research, Planning, and Evaluation, Department of Labor, Bldg. D, Chapman Rd., Route 273, Newark, Del. 19713.

District of Columbia

Chief, Branch of Labor Market Information and Analysis, D.C. Department of Labor, 605 G St. NW., Room 1000, Washington, D.C. 20001.

Florida

Chief, Research and Statistics, Division of Employment Security, Florida Department of Commerce, Caldwell Bldg., Tallahassee, Fla. 32304.

Georgia

Director, Information Systems, Employment Security Agency, Department of Labor, 254 Washington St. SW., Atlanta, Ga. 30334.

Hawaii

Chief, Research and Statistics, Department of Labor and Industrial Relations, P.O. Box 3680, Honolulu, Hawaii 96811.

Idaho

Chief, Research and Analysis, Department of Employment, P.O. Box 35, Boise, Idaho 83707.

Illinois

Manager, Research and Analysis Division, Bureau of Employment Security, Department of Labor, 910 South Michigan Ave., Chicago, Ill. 60605.

Indiana

Chief of Research, Employment Security Division, 10 North Senate Ave., Indianapolis, Ind. 46204.

Iowa

Chief, Research and Statistics, Department of Job Service,
1000 East Grand Ave.,
Des Moines, Iowa 50319.

Kansas

Chief, Research and Analysis, Department of Human Resources,
401 Topeka Avenue,
Topeka, Kans. 66603.

Kentucky

Chief, Research and Special Projects, Department of Human Resources,
275 E. Main St.,
Frankfort, Ky. 40601.

Louisiana

Chief, Research and Statistics, Department of Employment Security,
P.O. Box 44094,
Baton Rouge, La. 70804.

Maine

Director, Manpower Research Division, Employment Security Commission,
20 Union St.,
Augusta, Maine 04330.

Maryland

Director, Research and Analysis, Department of Human Resources,
1100 North Eutaw St.,
Baltimore, Md. 21201.

Massachusetts

Director, Information and Research, Division of Employment Security,
Hurley Bldg.,
Government Center,
Boston, Mass. 02114.

Michigan

Director, Research and Statistics Division, Employment Security Commission,
Department of Labor Bldg.,
7310 Woodward Ave.,
Detroit, Mich. 48202.

Minnesota

Acting Director, Research and Statistics Services, Department of Economic Security,
390 North Robert St.,
St. Paul, Minn. 55101.

Mississippi

Chief, Research and Statistics, Employment Security Commission,
P.O. Box 1699,
Jackson, Miss. 39205.

Missouri

Chief, Research and Statistics, Division of Employment Security,
Department of Labor and Industrial Relations,
P.O. Box 59,
Jefferson City, Mo. 65101.

Montana

Chief, Reports and Analysis, Employment Security Division,
P.O. Box 1728,
Helena, Mont. 59601.

Nebraska

Chief, Research and Statistics, Division of Employment,
Department of Labor,
P.O. Box 94600,
Lincoln, Nebr. 68509.

Nevada

Chief, Employment Security Research, Employment Security Department,
500 East Third St.,
Carson City, Nev. 89713.

New Hampshire

Director, Economic Analysis and Reports, Department of Employment Security,
32 South Main St.,
Concord, N.H. 03301.

New Jersey

Director, Division of Planning and Research, Department of Labor and Industry,
P.O. Box 2765,
Trenton, N.J. 08625.

New Mexico

Chief, Research and Statistics, Employment Security Commission,
P.O. Box 1928,
Albuquerque, N. Mex. 87103.

New York

Director, Division of Research and Statistics, Department of Labor,
State Campus,
Bldg. 1Z,
Albany, N.Y. 12240.

North Carolina

Director, Bureau of Employment Security Research, Employment Security Commission,
P.O. Box 25903,
Raleigh, N.C. 27611.

North Dakota

Chief, Research and Statistics, Employment Security Bureau,
P.O. Box 1537,
Bismarck, N.Dak. 58501.

Ohio

Director, Division of Research and Statistics, Bureau of Employment Services,
145 South Front St.,
Columbus, Ohio 43216.

Oklahoma

Chief, Research and Planning Division, Employment Security Commission,
310 Will Rogers Memorial Office Bldg.,
Oklahoma City, Okla. 73105.

Oregon

Assistant Administrator, Research and Statistics, Employment Division,
875 Union St. NE.,
Salem, Oreg. 97311.

Pennsylvania

Director, Research and Statistics, Bureau of Employment Security,
Department of Labor and Industry,
7th and Forster Sts.,
Harrisburg, Pa. 17121.

Puerto Rico

Chief of Research and Statistics, Bureau of Employment Security,
427 Barbosa Ave.,
Hato Rey, P.R. 00917.

Rhode Island

Supervisor, Employment Security Research, Department of Employment Security,
24 Mason St.,
Providence, R.I. 02903.

South Carolina

Director, Manpower Research and Analysis, Employment Security Commission,
P.O. Box 995,
Columbia, S.C. 29202.

South Dakota

Chief, Research and Statistics, Employment Security Department,
607 North Fourth St.,
Box 730,
Aberdeen, S. Dak. 57401.

Tennessee

Chief, Research and Statistics, Department of Employment Security,
Cordell Hull Bldg.,
Room 519,
Nashville, Tenn. 37219.

Texas

Chief, Economic Research and Analysis, Employment Commission,
TEC Bldg.,
15th and Congress Ave.,
Austin, Tex. 78778.

Utah

Director, Research and Analysis, Department of Employment Security,
P.O. Box 11249,
Salt Lake City, Utah 84147.

Vermont

Chief, Research and Statistics, Department of Employment Security,
P.O. Box 488,
Montpelier, Vt. 05602.

Virginia

Commissioner, Virginia Employment Commission,
P.O. Box 1358,
Richmond, Va. 23211.

Washington

Chief, Research and Statistics, Employment Security Department,
1007 So. Washington St.,
Olympia, Wash. 98501.

West Virginia

Chief, Labor and Economic Research, Department of Employment Security,
112 California Ave.,
Charleston, W. Va. 25305.

Wisconsin

Director, Research and Statistics, Department of Industry, Labor and Human Relations,
P.O. Box 7944,
Madison, Wis. 53701.

Wyoming

Chief, Research and Analysis, Employment Security Commission,
P.O. Box 2760,
Casper, Wyo. 82601.

TOMORROW'S JOBS

One statement can be made about the future with absolute certainty: It will be different from today. Constant change is one of the most significant aspects of the U.S. job market. Changes in 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 in all occupations. The growth of the population has spurred the need for workers to provide more housing, medical care, education, and other services and goods. The use of new technology has both created and eliminated hundreds of thousands of jobs. The computer, for example, has given birth to an entire new group of occupations—programmers, systems analysts, peripheral equipment operators—while at the same time it has decreased the need for inventory clerks, bookkeepers, and other clerical workers. 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 must come to terms with changes that occur in the job market. Your interests and abilities will determine the occupations that attract you, but future economic and social conditions will determine the job opportunities you face. Fortunately, most factors that alter the demand for workers in occupations—shifts in population or the labor force, the introduction of technology, and the development of new organization and management techniques—generally occur over several years. By examining what has happened in the recent past, it is possible to project future requirements for workers in industries and occupations. Although no one can forecast the future with certainty, these employment projections will help you learn about future opportunities in occupations that interest you.

Individual chapters of the *Handbook* present current trends and projections of employment for many occupations and industries. This chapter provides a perspective 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.

1 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 required and also affect the size and characteristics of the labor force—the people who work or are available to work. Three population trends 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.

1 **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 “baby boom,” after World War II. During the 1960’s, the rate of growth started to decline again. (Chart 1).

By 1990, the population is expected to increase to 244 million. This is 11 percent higher than the 1978 level of 219 million. 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. The differences are accounted for in part by the age distribution of the future population.

2 **Age Structure.** Because of the “baby boom,” the proportion of young people in the population has been high in recent years. Through the 1980’s, when these young adults start to enter the prime work years, the proportion of the population between the ages 25 to 44 will swell. By 1990, nearly one-third of the population will be in this age group. As a result of the relatively low number of births during the 1960’s and early 1970’s, the num-

ber 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 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.

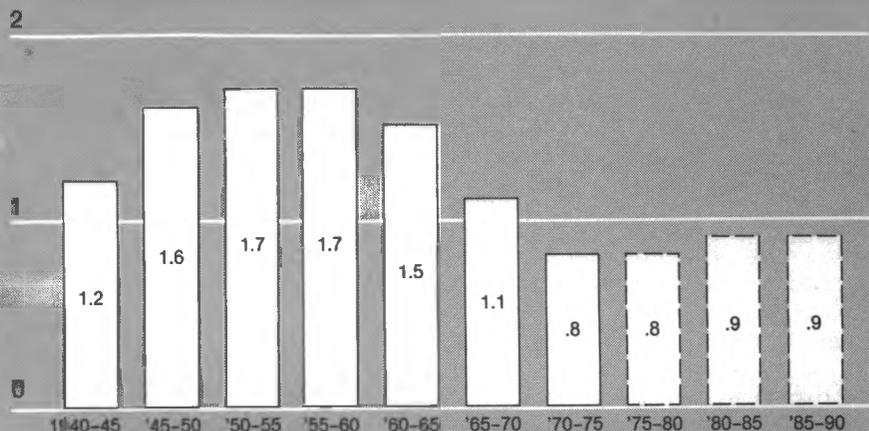
Shifts in the age structure of the population also will affect the composition of the labor force. These effects are discussed in a later section.

3 **Regional Differences.** National trends in population may not be the same as changes in a particular region or locality. A nation as large and diversified as the United States is bound to vary geographically in the rate of the population growth. For example, between 1970 and 1975, the average annual rates of population change in the Northeast and North Central regions were .2 percent and .4 percent compared with 1.5 percent and 1.6 percent for the South and West. These trends reflect the movement of people between states—to find new jobs, to retire, or for some other reason.

Chart 2 shows the projected trends in population growth among the states between 1975 and 1990 that will occur if the movement of people in the next decade is similar

Since the 1960's, the population has grown more slowly

Average annual percent increase

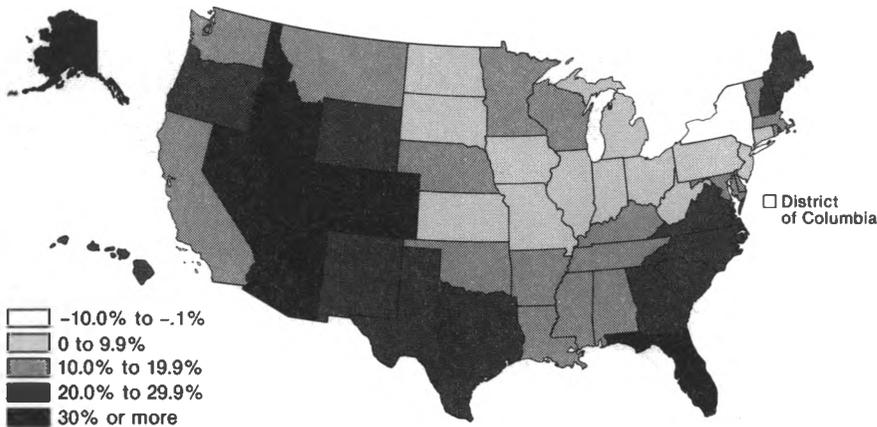


Source: Bureau of the Census

Because of interstate migration, changes in population will vary among States

2

Percent change in population, 1975 to 1990



Source: Bureau of the Census

workers—and people looking for jobs—the unemployed. 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 more women sought jobs. In 1978, the civilian labor force totaled about 100 million persons—63.2 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 about 119 million persons will be in the labor force—an 18.5 percent increase over the 1978 level. Contributing to this 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 entering the working age and less rapid growth of the participation rate of women. (Chart 3).

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 large number of young people who have entered the labor force in recent years, competition for many entry level jobs has been stiff and many young workers have been unemployed. As the number of people between 16 and 24—the ages when most people first enter the labor force—drops, competition for entry level jobs should ease. The 24 to 44 year old age group, those born during the "baby boom", will find jobs and gain work experience. The whole economy should benefit since experienced workers generally are more productive and less likely to be unemployed. (Chart 4).

Education. Employers always wish to hire the best qualified persons available. 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.

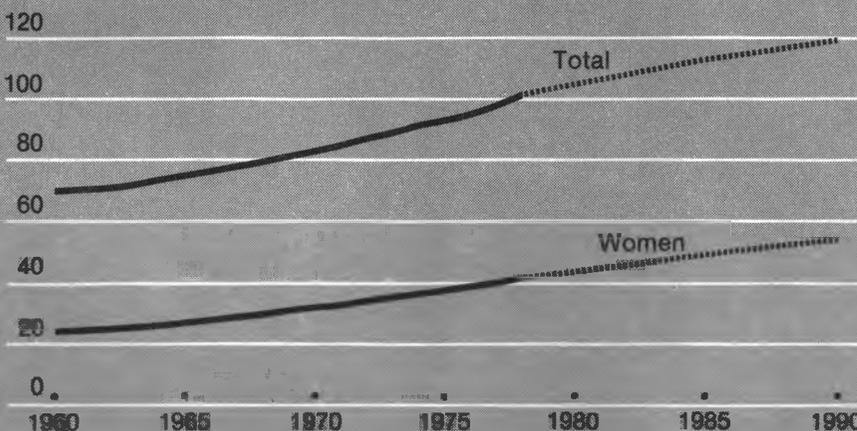
Persons contemplating dropping out of high school should recognize that a high school education has become standard. The educational attainment of the labor force has risen from 11.1 years of school in 1952 to 12.6 years in 1978. Thus, high school dropouts are likely to be at a serious disadvantage when seeking jobs that offer better pay or advancement unless they have specific training for the occupation they wish to enter. Many technical, craft, and office occupations now require postsecondary vocational education or apprenticeship, because employers prefer to hire trained applicants rather than provide training.

Traditionally, a college education has been viewed as a gateway to better pay, higher status, and more challenging work. As col-

3

Although labor force growth will slow during the 1980's, the proportion of women will increase

Persons 16 years and over (millions)



Source: Bureau of Labor Statistics

to that from 1970 to 1975. The population shift to the South and West will result in over half the population living in these areas by 1990.

Such geographic shifts in the population will alter the demand for and supply of workers in local job markets. In areas with growing populations for example, demand for services such as police and fire protection, water and sanitation will increase. At the same time more people looking for work in those areas could increase competition in some occupations. Individuals investigating future employment opportunities in an occupation should remember that local conditions could differ greatly from national projections presented in this *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 the various occupations. In addition, because workers are a vital part of the production process, the size of the labor force limits 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—wage and salary workers, self-employed workers, and unpaid family

lege 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 to 17 percent between 1952 and 1978. 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 1968 and 1978, employment of college graduates grew 76 percent. The proportion employed in professional and technical occupations, however, declined because these occupations did not expand as rapidly as the supply of graduates. As a result, 1 out of 4 college graduates took jobs traditionally filled by someone with less schooling. The proportion of graduates in clerical, lower-level sales, and 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 college degrees will be overcrowded, however. Despite widespread publicity about the poor job market for college graduates, graduates still hold a relative 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 college degrees should not be discouraged from pursuing careers that they believe match their interests and abilities, but they should be aware of job market conditions. The introductory section of the *Occupational Outlook Handbook for College Graduates* contains a more detailed discussion of the job prospects for college graduates.

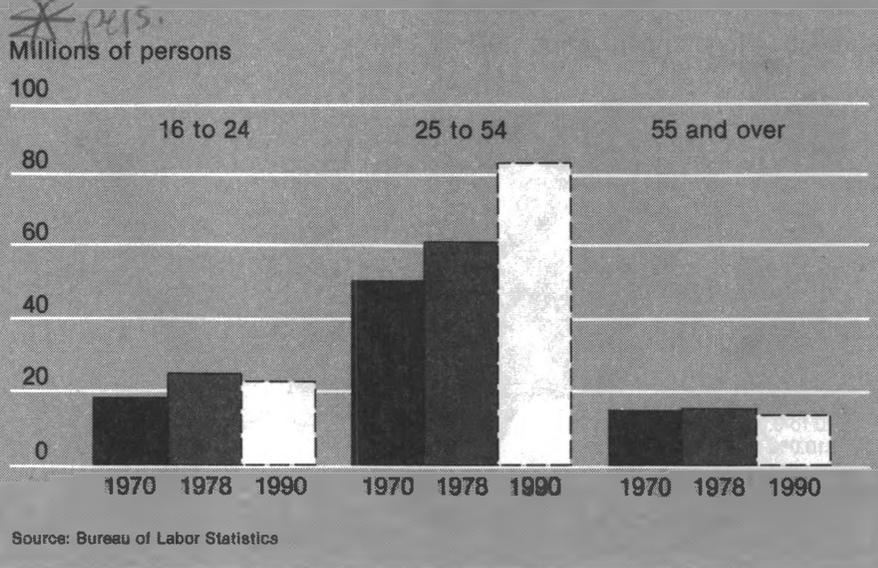
Employment

The previous sections discussed trends in the population and the labor force—two factors which affect employment opportunities. Other factors include the policies of the Federal government, the inflation rate, and the availability of energy. The following sections present estimates of 1990 employment in major industries and occupational groups; also included are discussions of the reasons for changes in the level of employment.

Changes in the population and the labor force and other factors determine the amount and type of goods and services that will be demanded in the future. If the demand for an industry's product increases in the future, more workers generally will be hired to increase production and employment in the industry will grow. Changes in occupational employment will result from growth in the industries that employ these workers. Every industry group has a unique mix of workers. Construction, for example, employs mostly blue-collar workers, while finance, insurance, and real estate is predominantly a white-collar industry group. (Chart 5). 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 high proportions of blue-collar workers.

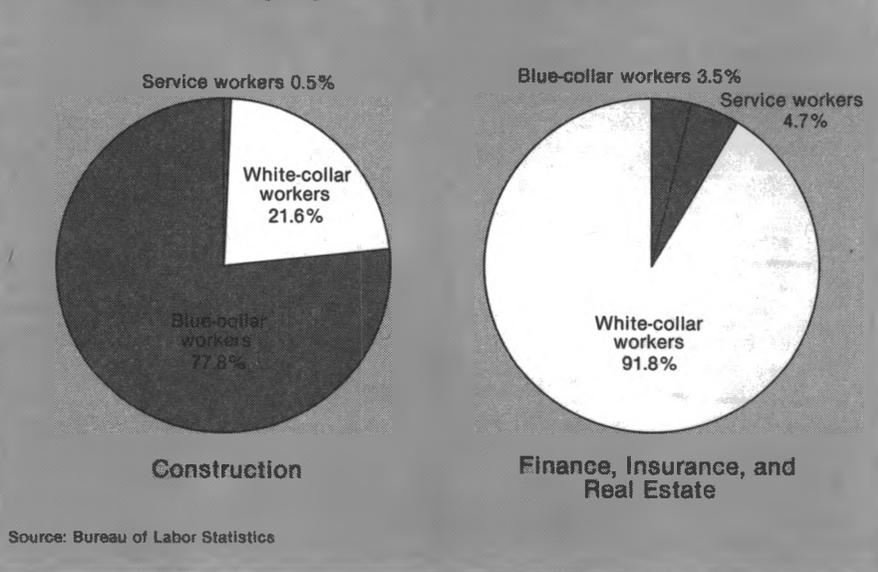
Through the 1980's, the number of workers in the prime working ages will grow dramatically

4



Industries differ substantially in the kinds of workers they employ

5



Growth in the finance, insurance, and real estate industries would result in an increase in demand for white-collar workers.

The estimates of employment growth in the following section are based on a model of the U.S. economy prepared by the Bureau of Labor Statistics. The model assumes, for the next decade, a moderately expanding labor force, a relatively slow decline in inflation, and moderate growth of government expenditures.

The Bureau also has prepared a high employment alternative model which assumes the Federal Government will seek to lower the unemployment rate rapidly by increasing grants to State and local governments. Because of government efforts to reduce unemployment, the model also assumes a faster

rate of growth for the labor force. Under these assumptions, employment in 1990 would be higher than estimated below for virtually every industry. A discussion of the assumptions and methods used to develop the two models can be found in a separate chapter of the *Handbook* and a more detailed explanation is given in *Employment Projections for the 1980's*, BLS Bulletin 2030.

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. As shown in chart 6, employment in service-producing industries has been increasing at a faster rate than employment in goods-producing industries. Among the factors that have contributed to this rapid growth are rising incomes and living standards that result in greater demand for schooling, health care, entertainment, and financial services. In addition, the growth of cities and suburbs brought a need for more local government services. Further, because many services in-

volve personal contact, people are less likely to be replaced by machines in service-producing industries.

Employment in the service-producing industries is expected to increase from 60.4 million workers in 1978 to 78.4 million in 1990 or about 30 percent. Growth will vary among industries within the group. (Chart 7). The following paragraphs summarize recent trends and the projections of employment in the five industrial sectors that make up the service-producing industries.

Transportation and public utilities. This is the slowest growing sector of the service-producing industries. Between 1965 and 1978, employment in this sector increased only half as fast as in the service-producing industries as a whole due largely to declining employ-

ment requirements in the railroad and water transportation industries. However, even in the communications industries where demand increased greatly, technological innovations limited employment growth.

Between 1978 and 1990, employment in the transportation and public utility sector is expected to rise from 4.9 to 5.4 million workers or 10 percent. Communications industries will grow the fastest of the industries in the sector, about 17 percent, from 1.2 to 1.4 million workers. Improvements in communications equipment which have minimized the cost for such services and greatly increased the demand, will keep employment from growing as rapidly as output.

Although employment in railroad and water transportation industries is expected to decline (but at a slower rate than before), other transportation industries such as air, local transit, and trucking will increase. Employment in transportation as a whole will rise about 7 percent from 2.9 to 3.1 million workers.

The demand for electric power, gas utilities, and water and sanitary services will increase through the 1990's as the population grows and more households are formed. Technological innovation in the systems used to provide these services will limit employment growth to about 8 percent from 780,000 workers in 1978 to 840,000 workers in 1990.

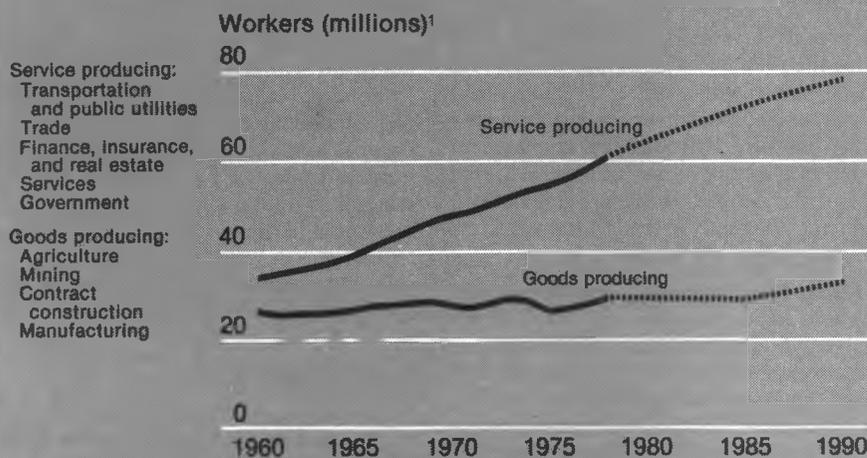
Trade. Both wholesale and retail trade employment have increased as the population has grown and as rising incomes have enabled people to buy a greater number and variety of goods. Retail trade has grown more than wholesale trade; the expansion of the suburbs has created a demand for more shopping centers. Between 1978 and 1990, wholesale and retail trade employment is expected to grow from 19.4 to 24.8 million workers or about 28 percent. Employment will continue to increase faster in retail trade than in wholesale trade, 34 percent compared to 8 percent. Employment will rise despite the use of some labor-saving innovations such as self-service merchandizing and computerized checkout systems. Some of the employment growth in retail trade will result from part-time workers replacing full-time workers.

Finance, insurance, and real estate. This sector grew 57 percent between 1965 and 1978 as these industries expanded to meet the financial and banking demands of a growing population. Within the sector, the two fastest growing industries have been banking and credit. Employment requirements have increased as banks provide more services, such as bank credit cards, and remain open longer hours.

Between 1978 and 1990, employment in this sector is expected to rise from 4.7 to 6.3 million workers or 34 percent. A growing population that increasingly uses credit to finance purchases will keep the consumer demand for credit and other financial services high. In addition, businesses will need assist-

Industries providing services will continue to employ more people than those providing goods

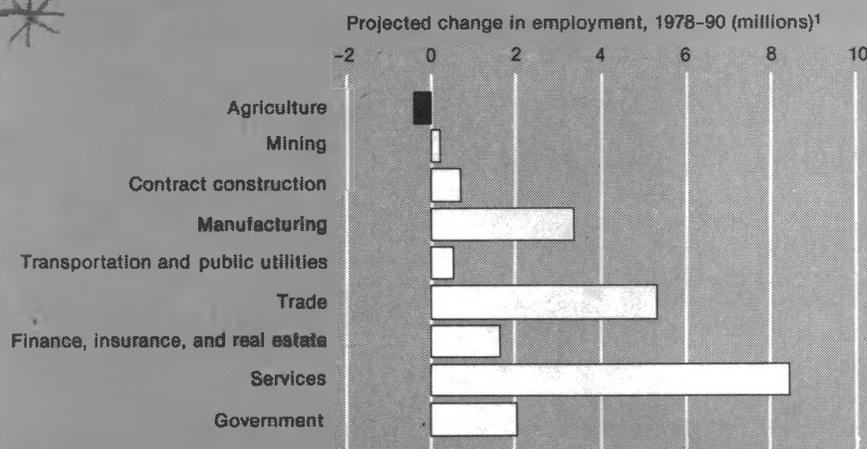
6



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

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

7



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

■ Employment decline □ Growth

ance 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 has grown faster than any other in the service-producing group, increasing 77 percent between 1965 and 1978. High demand for health care, maintenance and repair, advertising, and commercial cleaning services have been among the forces behind this growth.

From 1978 to 1990, employment in the service industries is expected to increase from 16 to 24.4 million workers or 53 percent, nearly twice the rate of the service-producing industries as a whole. Employment requirements in health care are expected to grow rapidly due to population growth—particularly the elderly—and rising incomes 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. Increased demand for services provided by the government—education, health and welfare, and police and fire protection caused employment in the government sector to rise about 54 percent between 1965 and 1978. Employment in State and local governments expanded 65 percent compared to 16 percent for the Federal Government.

School enrollments are expected to decline through the 1980's as a result of low births rates in the 1960's and 1970's. Consequently, State and local governments will cut employment in schools. New government programs to offset these cuts are unlikely because of the public's desire to limit government growth. As a result, between 1978 and 1990, government employment is expected to rise only 13 percent, from 15.5 to 17.5 million workers.

Goods-Producing Industries. Employment in the goods-producing industries rose only 9 percent between 1965 and 1978. Significant gains in productivity resulting from automated production, improved machinery, and other technological breakthroughs permitted large increases in output without additional workers. Between 1978 and 1990, employment in goods-producing industries is expected to increase from 28.7 to 32.5 million workers or about 13 percent. Growth rates will vary among the four sectors—agriculture, mining, construction, and manufacturing.

Agriculture. Employment in agriculture which has long been declining dropped nearly 23 percent between 1965 and 1978. At the same time output of farms has been increasing through the use of more and better machinery, fertilizers, feeds, pesticides, and hybrid plants.

Domestic demand for food will increase only slightly faster than the population 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 will continue to improve—although more slowly than in the past—and production is expected to rise even as employment continues to decline. Between 1978 and 1990, employment is projected to drop from 3.3 to 2.9 million workers or about 12 percent.

Mining. Having declined through most of the 1960's, employment in the mining sector increased substantially during the 1970's. Employment rose about 32 percent between 1965 and 1978, mostly because of the country's need for oil, coal, and other energy sources.

As the development of fuel sources continues through the next decade, employment in the mining sector is expected to grow from 830,000 to 1 million workers about 20 percent. In some nonenergy industries such as iron ore mining, employment will remain the same because of improvements in mining techniques.

Contract construction. Employment grew during the 1960's because of high demand for houses, apartments, office buildings, and highways. The slowdown of the economy during the early 1970's limited employment growth in the construction industries during most of the decade. However, employment has increased greatly in the last few years due to a strong demand for new housing.

During the early 1980's, the demand for new housing will remain high because the number of households is expected to increase. Business expansion and maintenance of existing buildings also will require more construction. Between 1978 and 1990, employment in the construction sector is expected to increase from 4.2 to 4.9 million workers or about 17 percent.

Manufacturing. Although a growing pop-

ulation and rising incomes have increased demand for almost all types of goods, improved production methods have limited employment growth in many manufacturing industries. In fact, employment grew more slowly in manufacturing than in any other sector between 1965 and 1978, only 13 percent.

Manufacturing employment is expected to rise to 23.6 million workers by 1990, a 16 percent increase from the 1978 level of 20.3 million workers. Demand for consumer goods is expected to rise because of increasing incomes. Demand for capital goods such as machinery also should rise as businesses expand their plants and foreign countries increase imports.

Manufacturing is divided into two broad categories, durable goods manufacturing and nondurable goods manufacturing. Employment in durable goods manufacturing is expected to increase by about 19 percent, from 12.2 to 14.5 million workers, while employment in nondurable goods manufacturing is expected to increase by only 11 percent, from 8.2 to 9.1 million workers.

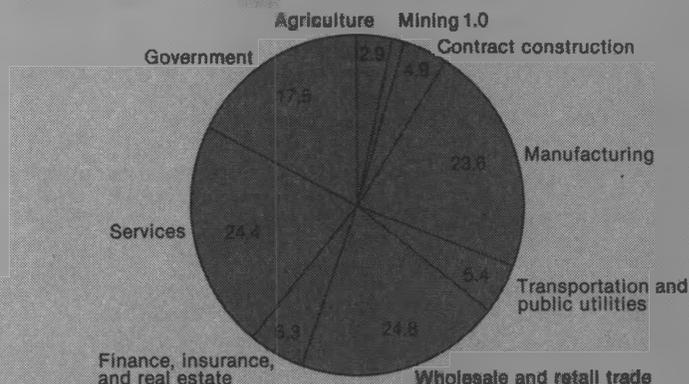
Growth rates will vary among individual industries within each of these categories. In nondurable goods industries, for example, employment in bakeries is expected to decline, while a moderate rise in employment is projected for the paper industry. Among durable goods industries, computers and peripheral equipment is expected to undergo a rapid employment increase; iron and steel manufacturing will employ about the same number of workers in 1990 as in 1978. (Chart 8).

Occupational Profile

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

Projected distribution of employment by Industry in 1990

Workers (millions)¹



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

Growth rates among these groups have differed markedly, as shown in chart 9. Once a small proportion of the total labor force, white-collar workers now represent about half of the total. 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 1978 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 1978 and 1990,

employment in this group is expected to grow from 14.2 to 16.9 million workers or about 19 percent.

Greater efforts in energy production, transportation, and environmental protection 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 professional workers to further develop and utilize computer resources also is projected to grow.

Some occupations in this group will offer less favorable jobs prospects, in many cases because the supply of workers will exceed openings. Teachers will continue to face competition, as will artists and entertainers, airline pilots, and oceanographers.

Managers and administrators. This group includes workers such as bank officers and managers, buyers, credit managers, and self-employed business operators. Between 1978 and 1990, this group is expected to grow from 10.1 to 12.2 million or 21 percent.

Changes in business size and organization 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 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, cashiers, secretaries, and typists. Between 1978 and 1990, employment in these occupations is expected to grow from 16.9 to 21.7 million workers or 28 percent.

New developments in computers, office machines, and dictating equipment will greatly affect employment in many occupations within this group. As computers are used more extensively to store information and perform billing, payroll, and other calculations, employment of file clerks and many types of office machine operators will level off or decline. At the same time, however, the need for computer and peripheral equipment operators will increase. Dictation machines, which have sharply reduced the need for stenographers, will continue to adversely affect employment prospects for workers in that occupation.

However, technological innovations will not affect many clerical workers whose jobs involve a high degree of personal contact. Substantial opportunities, for example, are anticipated for secretaries and receptionists.

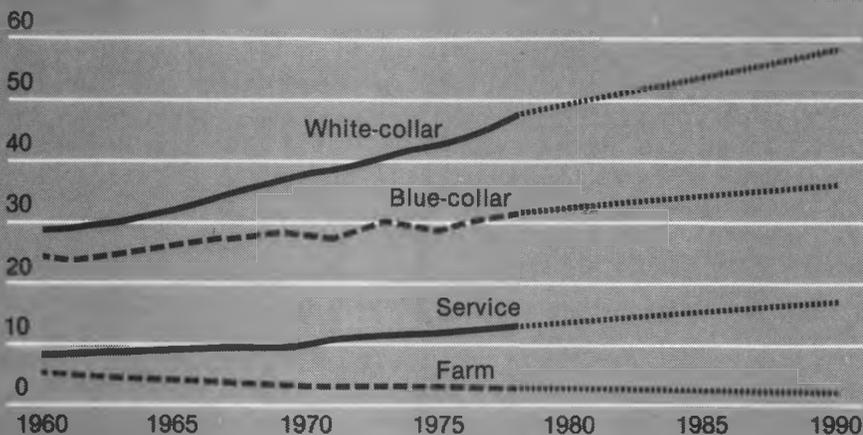
Sales workers. These workers are employed primarily by retail stores, manufacturing and wholesale firms, insurance companies, and real estate agencies. Employment of this group is expected to grow from 6.0 to 7.6 million workers, as increase of 27 percent.

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 requires more shopping centers and stores. Despite the use of labor-saving merchandizing 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

White-collar workers will continue to be the largest occupational group 9

Workers (millions)



Source: Bureau of Labor Statistics

Through the 1980's, changes in employment will vary widely among occupational groups 10

Projected change in employment, 1978-90 (millions)



Source: Bureau of Labor Statistics

makers, all-round machinists, electricians, and automobile mechanics. Between 1978 and 1990, employment of this group is expected to increase from 12.4 to 14.9 million or about 20 percent.

Employment in nearly all construction trades is expected to grow, but particularly rapid increases are anticipated for heavy equipment operators, electricians, and plumbers and pipefitters. Among mechanics and repairers, employment will increase most among workers who repair automobiles, computers and office machines, appliances, and industrial machinery.

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. This group includes such production workers as assemblers, production painters, and welders. Between 1978 and 1990, employment of operatives is expected to rise from 10.9 to 12.5 million workers or 15 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 some 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, forklifts, and taxis. Employment will increase because of the need for transportation services. Some occupations such as switch operators and bus drivers are expected to decline. Between 1978 and 1990, the number of transport operatives will rise from 3.5 to 4.1 million or 17 percent.

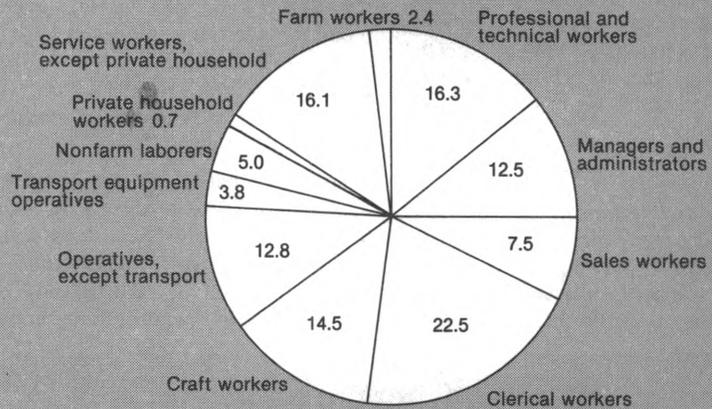
Nonfarm laborers. This group includes workers such as garbage collectors, construction laborers, and freight and stock handlers. Employment in this group is expected to grow only slowly as machinery increasingly replaces manual labor. Power-driven equipment, such as forklift trucks, cranes and hoists will handle more material in factories, loading docks, and warehouses. Other machines will do excavating, ditch digging, and similar work. Between 1978 and 1990, employment of laborers is expected to increase from 4.7 to 5.1 million workers or 9 percent.

Private household service workers. These workers include housekeepers, child care workers, and caretakers. Employment will decline from 1.2 million to 890,000 workers or 26 percent, between 1978 and 1990. Despite a rising demand for their services, the low wages and the strenuous nature of the work make these occupations unattractive to many people.

Projected distribution of employment by occupation in 1990

11

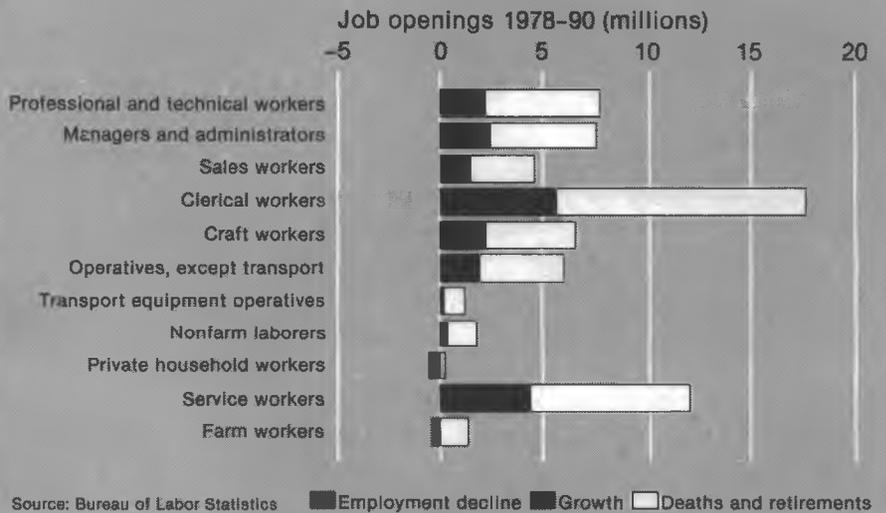
Workers (millions)



Source: Bureau of Labor Statistics

Job openings will result from employment growth, deaths, and retirements

12



Source: Bureau of Labor Statistics

■ Employment decline ■ Growth □ Deaths and retirements

Service workers. This group includes a wide range of workers—firefighters, janitors, cosmetologists, and bartenders are a few examples. These workers, most 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 commercial cleaning services, protective services; and—as incomes rise—more frequent use of restaurants, beauty salons, and leisure services. Between 1978 and 1990, employment of service workers is expected to increase 35 percent from 11.7 to 15.8 million workers.

Farm workers. This group includes farmers and farm operators 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 and better machinery, and the development of new feeds, fertilizers, and pesticides. Between 1978 and 1990, the number of farmworkers is expected to decline from 2.8 million to 2.4 million workers or 14 percent. (Chart 11).

Job Openings

Projected size and change in employment are two indicators of future job prospects; another is the total number of job openings expected in the occupation. The total includes job openings resulting from employment growth and the need to replace employees in an occupation who die, retire, transfer to another occupation, or simply stop working, perhaps to attend college or care for a family.

Between 1978 and 1990, replacement needs from deaths and retirements are expected to be twice those from employment growth. (Chart 12). Although data are not available to estimate other replacement needs, research findings indicate occupational transfers and temporary labor force separations are a larger source of job openings than growth, deaths, and retirements combined.

The relationship of replacement needs to employment in an occupation is complex and not completely understood. However, limited information indicates that some occupations will offer more job opportunities than their projected employment or growth rates would suggest.

Generally speaking, employees in occupations requiring the least training or experience—such as many operative, clerical, service, and sales occupations—have a higher replacement rate than other occupations. These workers can quit and later easily find a similar job. On the other hand, occupations requiring the most training or experience—such as professional and managerial occupations—tend to have the lowest replacement rates. Physicians, engineers, and bank managers, for example, have extensive training and there are few occupations to which they could transfer without taking a cut in pay.

Unfortunately, projected data about total

replacement needs are not available. However, the patterns of the past are unlikely to change significantly: Occupations which require little training will provide more employment opportunities from replacement needs than occupations which require extensive training or experience.

When reviewing the employment projections, keep in mind replacement needs. Because of job transfers, deaths, retirements, and other labor force separations, employment opportunities may exist even in occupations where employment is expected to decline or to increase slowly.

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 research offices provided much of these data, but many other agencies of the Federal Government were important contributors, including the Bureau of Apprenticeship and Training of the Department of Labor; the Bureau of the Census of the Department of Commerce; the Office of Education and the Rehabilitation Services Administration of the Department of Education; the Veterans Administration; the Office of Personal 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 fields discussed. The Bureau, of course, takes full responsibility for the published material.

After the information from these sources was compiled, it was analyzed in conjunction with the Bureau's model of the economy in 1990. Like other models used in economic forecasting, the Bureau's model encompasses the major facets of the economy and represents a comprehensive view of its projected structure. It is comprised of internally consistent projections of gross national product (GNP); industrial output and productivity; labor force; average weekly hours of work; and employment for detailed industry groups and occupations. A detailed description of the model appears in *Methodology for Projections of Industry Employment*, Bulletin 2036 (forthcoming).

Assumptions. The Bureau's projections to 1990 are based on the following general assumptions.

—Inflation will decelerate to 5.2 percent annually during 1980–90.

—A stable, long-run unemployment rate close to 4.5 percent will be achieved by the mid-1980's.

—Higher energy prices will not constrain growth in 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.

Detailed information about the assumptions used in the projections are presented in *Employment Projections for the 1980's*, BLS Bulletin 2030.

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 then is translated into the level of GNP that would be produced by a fully employed labor force. GNP is obtained 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 work hour) 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. Each of these components is 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. These projections are then compared with employment projections derived using regression analysis. This analysis develops equations 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. By comparing projections resulting from input-output analysis and regression analysis, areas may be identified where one method produces a projection inconsistent with trends or with the Bureau's economic model. The projections are then adjusted accordingly.

Occupational employment projections. Projections of industry employment are translated into occupational employment projections using an industry-occupation matrix. This matrix, which is divided into 200 industry sectors and 400 occupation sectors, describes the current and projected occupational structure of each industry. By applying the projected occupational structure for each industry to the industry employment projection and aggregating the resulting estimates for all industries, employment projections for each of the 400 occupations contained in the matrix are obtained. 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 related directly to one of the components of the Bureau's model—for example, the number of cosmetologists is related to consumer expenditures for beauty shop services. In others, employment is related to an independent variable not explicitly projected in the model

but believed to be a primary determinant of employment in that occupation. The projection of automobile mechanics, for example, 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 for each occupation, a projection is made of the number of workers who will be needed to replace those who die

or retire. To estimate these replacement needs, the Bureau has developed tables of working life based on actuarial experience for deaths, and on decennial Census data for general patterns of labor force participation. Tables of working life provide death and labor force separation rates for the entire labor force, by age and sex groups. The rate for each age and sex group then is adjusted to reflect expected changes in labor force behavior. An overall separation rate for an occupation is obtained by weighting each pro-

jected rate by employment in the occupation for that age and sex group, and computing the weighted average. Average annual replacement needs are calculated by applying the projected occupational separation rate to projected employment.

The Bureau is continuing research to determine the effect of occupational transfers and temporary labor force separations on job openings. These transfers have not been taken into account in calculating replacement needs.

The Outlook for Occupations

Industrial Production

Office • Service

Education • Sales

Construction

Transportation

Scientific and Technical

Mechanics and Repairers

Health

Social Scientists • Social Service

**Performing Arts, Design, and
Communications**

INDUSTRIAL PRODUCTION AND RELATED OCCUPATIONS

Cars, newspapers, radios, bathtubs, guided missiles, eating utensils, books, and pencil sharpeners all have at least one thing in common. They, and almost all other products that we use, are made by the millions of workers in industrial production and related occupations.

Most of these operatives and craft workers are employed in factories in the mass production of goods. Others work outside of manufacturing in a wide variety of activities ranging from showing motion pictures to shoeing horses.

Because mass production would not be possible without interchangeable parts, workers in the machining and foundry occupations play a basic role in the production process. These workers make the tools, dies, molds, cores, and other items that can be used to produce hundreds or even thousands of identical parts. Assemblers then put these parts together to make automobiles, telephones, and hundreds of other products. If the parts or finished products require paint-

ing, production painters do that job. After the products are made, inspectors examine and test them to insure quality.

Other factory workers are not directly involved in the production process, but support it in some way. Stationary engineers, for example, operate boilers and other equipment to heat and air-condition factories and other buildings. Millwrights move and install heavy machinery used in the production process and power truck operators move materials about the plant.

Printing is another type of mass production. Printing craft workers operate the machinery used to print newspapers, books, and other publications.

Industrial workers also are employed outside of manufacturing in a variety of activities. Automobile painters, for example, restore the finish on old and damaged cars. Photographic laboratory workers develop film and make prints and slides.

Most jobs in industrial production do not

require a high school diploma. However, many employers prefer high school or vocational school graduates who have taken courses such as blueprint reading and machine shop.

Operatives, such as assemblers and power truck operators, ordinarily need only brief on-the-job training. Craft workers, such as stationary engineers and machinists, require considerable training to qualify for their jobs. Many learn their trades on the job, but training authorities generally recommend completion of a 3- or 4-year apprenticeship program as the best way to learn a skilled trade.

This chapter includes statements on more than 30 industrial production and related occupations. Many other workers who are involved in industrial production are described elsewhere in the *Handbook* because of their close association with particular occupations. For example, engineers are included in the section on scientific and technical occupations.

Foundry Occupations

The average American home contains over 2 tons of metal castings. Cooking utensils, stoves, sinks, bathtubs, and refrigerators are just a few of the everyday products we use that are cast or have cast metal parts. In addition, many industries use cast products. Machinery made of castings processes food, generates electricity, and stamps out parts for assembly lines.

The process of casting forms metal into intricate objects by pouring molten metal into carefully prepared molds and allowing it to solidify. When the hot metal cools, castings take the shape of the mold cavity.

The *patternmaker*, the *molder*, and the *coremaker* each play an important part in the process. A *patternmaker* makes an exact wood or metal model of the casting. A *molder* then places the model in a box and packs a sand mixture around it to form a mold. If the casting is to have a hollow section, such as an automobile engine block, a *coremaker* makes a core of a packed and hardened sand mixture that is positioned in the mold before the molten metal is poured in.

In 1978, about 3,700 patternmakers, 21,000 molders, and 12,000 coremakers worked in the foundry industry. About three-fourths of them worked in shops that make and sell castings. The remainder worked in plants that make castings to use in their final products, such as plants operated by manufacturers of automobiles or machinery.

A high school education is the minimum requirement for an apprenticeship in patternmaking. Some highly skilled molding and coremaking jobs also may require a high school education, but an eighth grade education may be enough for entry into many molding and coremaking jobs.

The production and use of castings are expected to grow significantly through the 1980's. However, because of automation and other labor-saving improvements in production methods, employment of patternmakers, coremakers, and molders is expected to increase more slowly than the average for all occupations. In addition to those job openings that result from employment growth, other openings will arise from the need to replace experienced workers who die, retire, or transfer to other occupations. The number of openings may fluctuate from year to year because foundry employment is sensitive to ups and downs in the economy.

Patternmakers, molders, and coremakers are discussed in detail in the following statements. For general descriptions of the casting process and many of the other jobs involved

in metal casting, see the statement on foundries elsewhere in the *Handbook*.

Sources of Additional Information

For details about training opportunities for patternmakers, molders, and coremakers, contact local foundries, the local office of the 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 the following organizations:

American Foundrymen's Society/Cast Metals Institute, Golf and Wolf Rds., Des Plaines, Ill. 60016.

International Molders' and Allied Workers' Union, 1225 E. McMillan St., Cincinnati, Ohio 45206.

Patternmakers

Nature of the Work

A high quality cast product depends upon the initial pattern created by the foundry patternmaker. The formation of the hollow mold cavity, and ultimately the metalcasting itself, rely 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 made from it.

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 rasps.

Wood patternmakers (D.O.T. 661.281-022) select the wood stock, lay out the pattern, and saw 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.

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.

Training, Other Qualifications, and Advancement

Apprenticeship is the best means of qualifying as an experienced patternmaker. 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, and shop mathematics are helpful to persons interested in becoming patternmakers. 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.

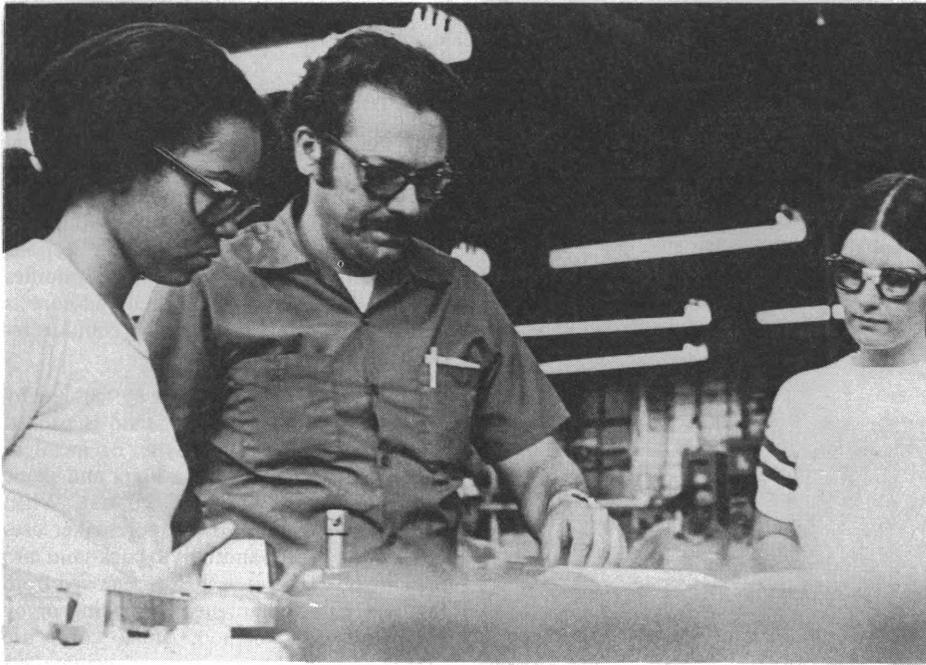
The usual apprenticeship period for patternmaking is 5 years; however, a few apprenticeships last only 3 or 4 years. At least 144 hours of classroom instruction generally accompany the work experience provided each year. Because of the precise skills needed, apprenticeship programs for wood and metal 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 nature of the work. The ability to visualize objects in three dimensions also is important when reading blueprints.

Employment 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



Using detailed blueprints, patternmakers design cast products.

metal patterns will allow production to increase faster than employment. Because metal patterns, unlike wooden ones, can be used again and again, fewer patterns have to be made. In addition to those openings created by employment growth, some job openings will arise because of the need to replace experienced patternmakers who retire, die, or transfer to other occupations. Most of these openings will be for metal patternmakers. The number of openings may fluctuate from year to year since the demand for foundry products is sensitive to changes in the economy.

Earnings

Patternmakers generally have higher earnings than other production workers in manufacturing. In January 1979, average straight-time hourly earnings of wood patternmakers ranged from \$7.30 in nonferrous foundries to \$7.90 in gray iron and malleable foundries, according to a wage survey made by the National Foundry Association. In comparison, all production workers in manufacturing industries averaged \$6.48 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 watch), form builders (aircraft-aerospace manufacturing), last-pattern graders (shoes), loft workers (ship and boat building and repairing), mock-up builders (transportation equipment), and wood model makers (any industry).

Sources of Additional Information

For sources of additional information, see the introductory section of this chapter.

Molders

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 and allowing the metal to harden in the shape of the mold. There are several different ways of making molds, but sand molding is the most common because it is so economical. In sand molding, molders pack and ram a specially prepared mixture of sand and other binders, such as clay and chemicals, around a pattern of the object that is to be cast. The mixture 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. (Other types of molds and molding processes are described in the foundry industry section of the *Handbook*).

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. This includes setting up the machine, controlling the pressure applied to the sand by the working 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 mallets, 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 casting are made on the foundry floor by *floor molders* (D.O.T. 518-361-010). An all-around hand molder makes many different types of molds. A less skilled molder specializes in a few simple types.

Working Conditions

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; however, in many older foundries these still are problems.

Working in a foundry can be hazardous, and the injury rate is higher than the average for all manufacturing industries. Safety programs and safety equipment, such as metal-plated shoes, have helped reduce injuries at many foundries; however, molders must be careful to avoid burns from hot metal and to avoid cuts and bruises when handling metal parts, molds, and power tools.

Training, Other Qualifications, and Advancement

Completion of a 4-year apprenticeship program, or equivalent 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 apprenticeship. Many employers prefer high school graduates, however.

Apprentices, under close supervision by skilled molders, 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 arithmetic, metallurgy, and shop drawing.



Pouring molten metal requires concentration and a steady hand.

Hand molders who do highly repetitive work that requires less skill usually learn their jobs during a brief training period. Trainees work with a molder to make a particular kind of mold. After 2 to 6 months, the trainee usually is capable of making a similar mold. Most machine molders also learn the necessary skills in a few months of informal on-the-job training.

Physical standards for molding jobs are fairly high. 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 eventually to a supervisory position.

Employment Outlook

Employment of molders is expected to increase more slowly than the average for all occupations through the 1980's. Although the demand for metal castings is expected to increase significantly, the trend toward more automatic machine molding, such as the sand slinging process, and other laborsaving innovations will allow large increases in production with only moderate employment

growth. In addition to job openings created by employment growth, openings will arise from the need to replace experienced molders who retire, die, or transfer to other occupations. The number of openings, however, may fluctuate greatly from year to year because the demand for foundry products is sensitive to changes in the economy.

Earnings

In January 1979, floor molders averaged \$6.20 an hour and bench molders averaged \$5.90, according to a wage survey made by the National Foundry Association. By comparison, production workers in all manufacturing industries averaged \$6.48 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, and jewelry benchmolders.

Sources of Additional Information

For sources of additional information, see the introductory section of this chapter

Coremakers

Nature of the Work

Many cast metal products—iron piping, 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 solidifies 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, sand is packed into a block of wood, plastic, or metal in which a cavity of the desired size and shape has been formed or machined out. When hand methods are used, the coremaker uses mallets 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 forcing sand into a core box. Some machine coremakers are required to set up and adjust their machines and do finishing operations on the cores. Others are primarily machine tenders. They are closely supervised and their machines are adjusted for them. (To see how the coremaker's job is a basic step in the casting process, read the description of sand casting given in the statement on foundries elsewhere in the *Handbook*.)

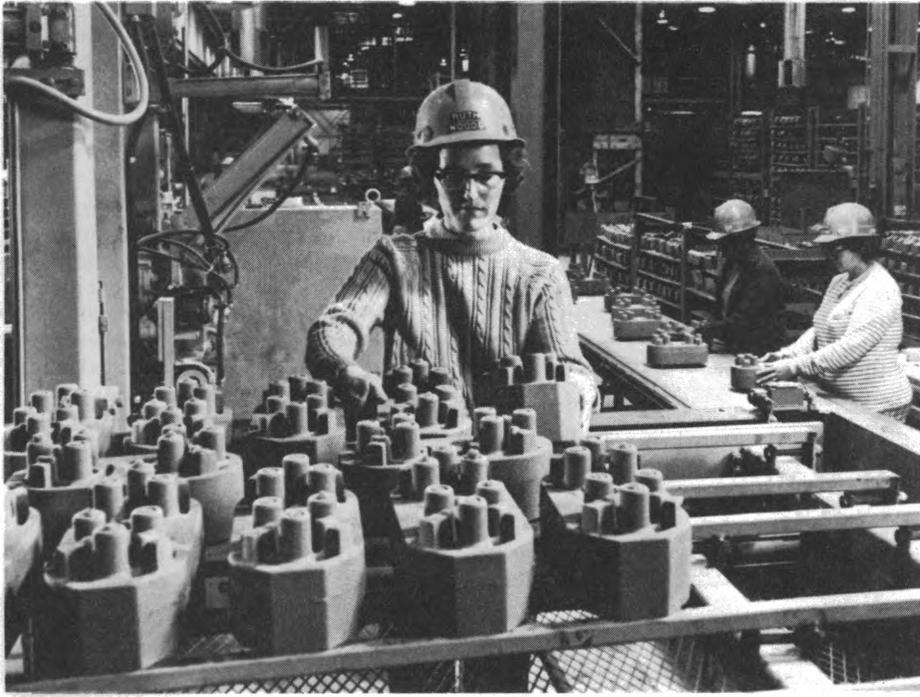
Working Conditions

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. Although the injury rate in foundries is higher than the average for manufacturing, coremaking is one of the least hazardous foundry jobs.

Training, Other Qualifications, and Advancement

Completion of a 4-year apprenticeship training program or the equivalent experience is needed to become a skilled hand coremaker. Workers with this training also are preferred for the more difficult machine coremaking jobs, but in general a shorter training period is required to become a qualified machine coremaker. Apprenticeships in coremaking and molding often are combined.

Experienced coremakers teach apprentices how to make cores and operate ovens. Classroom instruction covering subjects such as arithmetic and the properties of metals generally supplements on-the-job training. Core-



Coremakers prepare the "cores" that form the hollow sections for automobile engine blocks.

makers earn higher pay as their skill increases, and some may advance to supervisors.

An eighth grade education usually is the minimum requirement for coremaking apprentices; however, most employers prefer high school graduates, and some employers require apprentices to have graduated from

high school. Some types of hand coremaking require a high degree of manual dexterity.

Employment 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 employment growth. In addition to those job openings created by employment growth, other openings will arise because of the need to replace experienced coremakers who retire, die, or transfer to other occupations. The number of openings may fluctuate greatly from year to year since the demand for foundry products is sensitive to changes in the economy.

Earnings

In January 1979, average hourly earnings of floor coremakers were \$6.30; bench coremakers, \$6 and machine coremakers, \$5.40, according to a wage survey made by the National Foundry Association. By comparison, production workers in all manufacturing industries averaged \$6.48 an hour. Coremakers who were paid on an incentive basis generally had higher earnings than those who were paid a straight hourly wage.

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 checkers, and coreroom foundry laborers.

Sources of Additional Information

For sources of additional information, see the introductory section of this chapter.

Machining Occupations

Machine tools are stationary, power-driven machines used to shape or form metal by cutting, impact, pressure, electrical techniques, or a combination of these processes.

The most outstanding characteristic of machine tools is their precision of operation. For example, in this century the accuracy of machine tools has improved from a thousandth of an inch to about a millionth of an inch. A millionth of an inch is about 1/300th as thick as a human hair. This precision makes possible the production of thousands of identical parts which may easily be interchanged in the assembly or repair of final products. The interchangeability of parts, made possible by machine tools, is the most important requirement for the mass production of goods. As a result, nearly every product of American industry, from cornflakes to turbines, is made either using machine tools or using machines made with machine tools.

Most machine tools are named for the way in which they shape metal. For example, commonly used machine tools include boring machines, milling machines, lathes, drilling machines, and grinding machines. All-round machinists can operate most types of machine tools, whereas machine tool operators generally work with one kind only. Tool-and-die makers make dies (metal forms) for presses and diecasting machines, devices to guide drills into metal, and special gages to determine whether the work meets specified tolerances. Instrument makers use machine tools to produce highly accurate instrument parts from metal and other materials. Setup

workers adjust tools for semiskilled machine tool operators to run. In 1978, over 1.1 million workers were employed in these occupations. The following chapters present detailed discussions of the work performed, training required, job outlook, and earnings for these occupations.

All-Round Machinists

(D.O.T. 600.280-022, .281-022, and .381-018)

Nature of the Work

All-round machinists are skilled metal workers 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 cars, machines, and other equipment. They also know the working properties of a variety of metals such as steel, cast iron, aluminum, brass, and other metals that are used to make these parts. Using this knowledge of metals, plus their skill with machine tools, production machinists plan and carry out all the operations needed to make a machined product.

Before they actually begin work on a part, machinists usually consult blueprints or written specifications for the item. Using these, they select tools and materials for the job and

plan the cutting and finishing operations. When making a rifle barrel, for example, they might select an alloy steel workpiece and then use a boring machine to cut out the rifle bore. After selecting a workpiece and the appropriate machine for the job, machinists make standard shop computations relating to dimensions of work and machining computations. They must, for example, determine the exact point on the workpiece where they will bore the hole. They also must decide how fast they can feed the metal workpiece into the machine, and what cooling oils they should use to keep the metal from overheating and ruining the job.

To be sure their work is accurate, they check it using precision instruments, such as micrometers, which measure to thousandths or even millionths of an inch. After completing machining operations, they may use hand files and scrapers to smooth rough metal edges before assembling the finished parts with wrenches and screwdrivers.

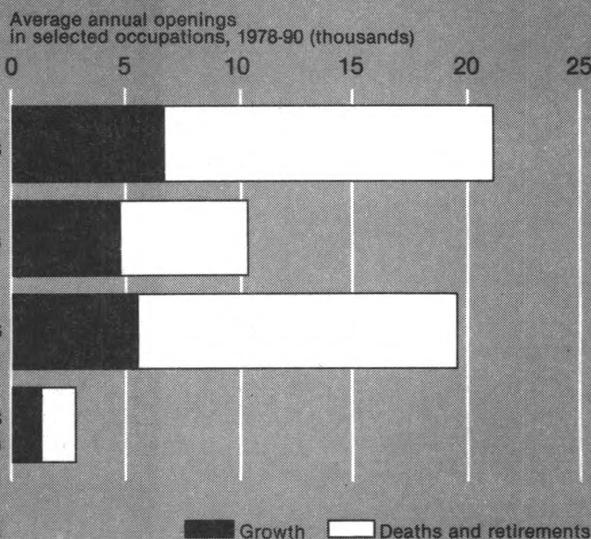
Like production machinists, all-round machinists who work in plant maintenance shops have a broad knowledge of metals, of how machines work, and of machining operations. These workers are responsible for repairing parts or making new parts for machinery that has broken down. They sometimes also adjust and test the parts they have made or repaired for a machine.

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 those shops where noise still is a problem, workers wear earmuffs or earplugs to protect their hearing. Good "housekeeping" now is emphasized in most machine shops, and helps make shops safer by reducing the chances of accidents caused by slippery floors or blocked aisles between the machine tools.

Working around high-speed machine tools, however, can still present certain dangers. Flying pieces of hot metal, for example, can cause burns and cuts. As a result, machinists must follow strict safety practices. Safety glasses with side shields, and other protective devices must be worn; loose or billowy clothing, long hair, and rings or other jewelry are prohibited. These regulations help prevent once common accidents, such as burns from hot metal, cuts and other injuries caused by flying metal pieces, and parts of the body getting caught and mangled in the machine tool.

Jobs will be more plentiful for highly skilled machinists than for less skilled workers



Source: Bureau of Labor Statistics

■ Growth □ Deaths and retirements

Places of Employment

About 400,000 persons worked as machinists in 1978. Almost every factory that uses substantial amounts of machinery employs all-round machinists to maintain its mechanical equipment. In some factories, machinists made large quantities of identical parts such as automobile axle shafts in production departments. In others, machinists made limited numbers of varied products such as missile motor cases in machine shops.

Most all-round machinists worked in the following industries: Machinery, including electrical; transportation equipment; fabricated metal products; and primary metals. Other industries employing substantial numbers of these workers were the railroad, chemical, food processing, and textile industries. The Federal Government also employed 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 training programs for single-purpose machines that require less than 4 years to complete. Many machinists do learn this trade on the job, however.

Persons interested in becoming machinists should be mechanically inclined so that they can use the tools and machines required in their work and so that they can understand the often complex mechanisms it is their job to build. 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 take additional courses in mathematics and electronics at company expense so that they can 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 read-

ing, mechanical drawing, shop mathematics, and shop practices.

All-round machinists have numerous opportunities for advancement. Many become supervisors. Some 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.

Employment Outlook

The number of all-round machinists is expected to increase at about the same rate 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 to openings created by growth in this large occupation, many openings will arise from the need to replace experienced machinists who retire, die, or transfer to other fields of work.

As population and income 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.

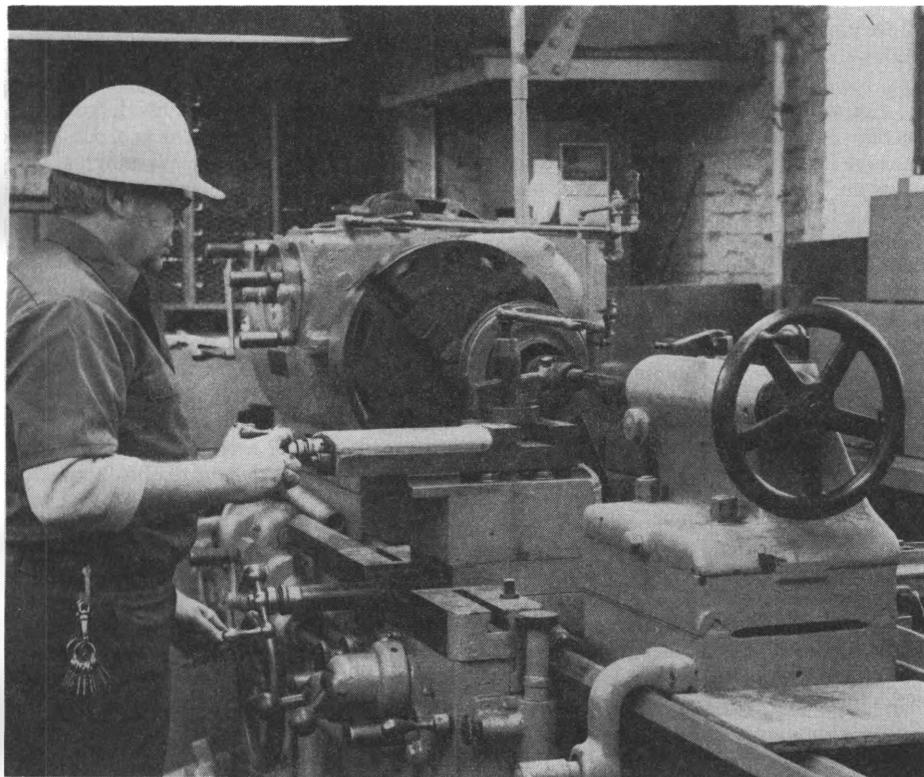
Chief among these technological innovations is the use of numerically controlled machine tools. These machines, which use computers to control various machining operations, significantly reduce the time required to perform machining operations.

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.

Earnings

The earnings of machinists compare favorably with those of other skilled workers. Machinists employed in metropolitan areas had estimated average hourly earnings of \$8.02 in 1978. 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 indoors, they are able to work year round and in all kinds of weather. As a result, their earnings are relatively stable. Many also receive numerous opportunities for overtime work.

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



Many companies employ maintenance machinists to repair or make new parts for machinery that has broken down.

Table 1. Average hourly earnings of all-round machinists in selected areas, 1978

| Area | Hourly rate |
|---------------------------------|-------------|
| San Francisco-Oakland | \$9.56 |
| Detroit | 9.01 |
| Houston | 8.67 |
| Chicago | 8.39 |
| New York | 8.33 |
| Minneapolis-St. Paul | 8.11 |
| Atlanta | 8.10 |
| New Orleans | 8.05 |
| Boston | 7.15 |
| Jackson, Miss. | 6.65 |

SOURCE: Bureau of Labor Statistics.

Electrical Workers; and the United Steelworkers of America.

Related Occupations

The occupations most closely related to all-round machinists are, of course, the other machining occupations. These include tool-and-die makers, machine tool operators, setup workers (machine tool), and instrument makers. There are other occupations that require precision and skill in working with metal, however, including arc cutters, blacksmiths, gunsmiths, locksmiths, pattern-makers (metal), and welders.

Sources of Additional Information

The National Machine Tool Builders Association, 7901 Westpark Dr., McLean, Va. 22102—whose members build a large proportion of all machine tools used in this country—will supply, on request, information on career opportunities in the machine tool industry.

The National Tool, Die and Precision Machining Association, 9300 Livingston Rd., Washington, D.C., 20022, offers 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.

The Tool and Die Institute, 777 Busse Highway, Park Ridge, Ill. 60068—a trade association—offers information on apprenticeship training in the Chicago area.

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, applicants for apprenticeship also are received by labor-management apprenticeship committees.

Apprenticeship information also may be obtained from the following unions (which have local offices in many cities):

International Union, United Automobile, Aerospace and Agricultural Implement Workers of America, Skilled Trades Department, 8000 East Jefferson Ave., Detroit, Mich. 48214.

International Union of Electrical, Radio and Machine Workers, 1126 16th St. NW., Washington, D.C. 20036.

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 fabricate metal parts for the instruments they make. 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, using a wide variety of precision measuring equipment, including micrometers, verniers, 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 finer tolerances than other machining workers. Sometimes specifications must not vary more than 10 millionths of an inch. To meet these standards, they use special equipment or precision devices, such as the electronic height gauge, which other machining workers sel-

dom 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 all the parts, assemble them, and 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 from occurring, instrument makers must follow certain safety rules when using machine tools. These rules include the wearing of special glasses, aprons, and tightly fitted clothing.

Places of Employment

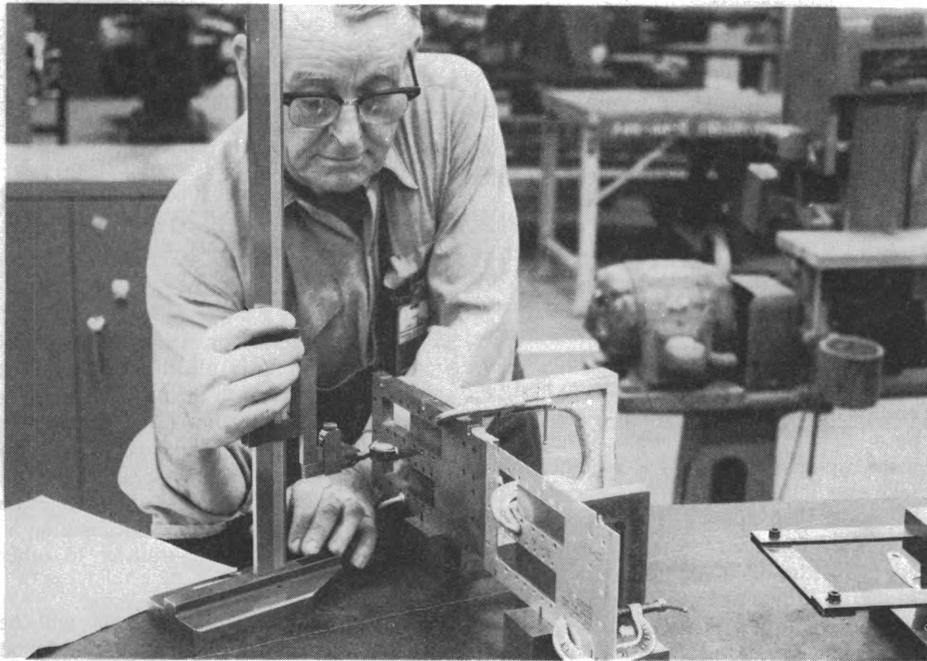
Many of the approximately 6,000 instrument makers employed in 1978 worked for firms that manufactured instruments. Others were in research and development laboratories that make special devices for scientific research. The Federal Government employed many instrument makers.

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 the simpler 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 de-



Instrument makers often do very precise work.

sign. Apprentices must learn enough shop mathematics to plan their work and to use formulas. A basic knowledge of how things work is needed in solving gear and linkage problems.

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.

Employment 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. Most openings, however, will occur as workers retire, die, or leave the occupation for other reasons. Overall, replacement needs will be small because there are so few workers in this field.

Some workers will be needed to make models 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. Laborsaving technological innovations, however, will limit employment growth. Numerically controlled machine tools, for example, reduce the amount of labor required in machining operations.

Earnings

Earnings of instrument makers compare favorably with those of other highly skilled metalworkers. In 1978, instrument makers generally earned over \$8 an hour.

Many instrument makers are union members. Among the unions representing them 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

The occupations most closely related to instrument maker are, of course, the other machining occupations. These include all-round machinists, tool-and-die makers, setup workers (machine tool), and machine tool operators.

Other occupations that require precision and skill in working with metal include arc cutters, blacksmiths, locksmiths, pattern-makers (metal), and welders.

Sources of Additional Information

See the list under this same heading in the previous statement on all-round machinists.

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. By using special, easy-to-use gages they watch the machine and make minor adjustments. However, they depend on skilled machining workers for major adjustments when their machine is 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 oils to keep the metal workpiece from getting too hot and lubricating oils 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 contained on modern machine tools, but operators of older machine tools sometimes have to stand on slippery floors caused by spilled coolants. Good shop practices and attention to cleanliness, however, can significantly reduce this danger.

Powerful, high-speed machine tools can still be dangerous, though, if strict safety rules are not observed. Machine tool operators must wear safety glasses and other protective 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.

Places of Employment

More than 500,000 machine tool operators were employed in 1978. 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 tedious, 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.

Employment 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, many thousands of openings are expected to occur each year in this large occupation as operators retire, die, or transfer to other fields of work.

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 growth. Other factors that may slow growth in this occupation are the increasingly important new processes in metalworking, such as electrical discharge and ultrasonic machining, and the use of powdered metals that reduce the machining necessary for a final product.

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.

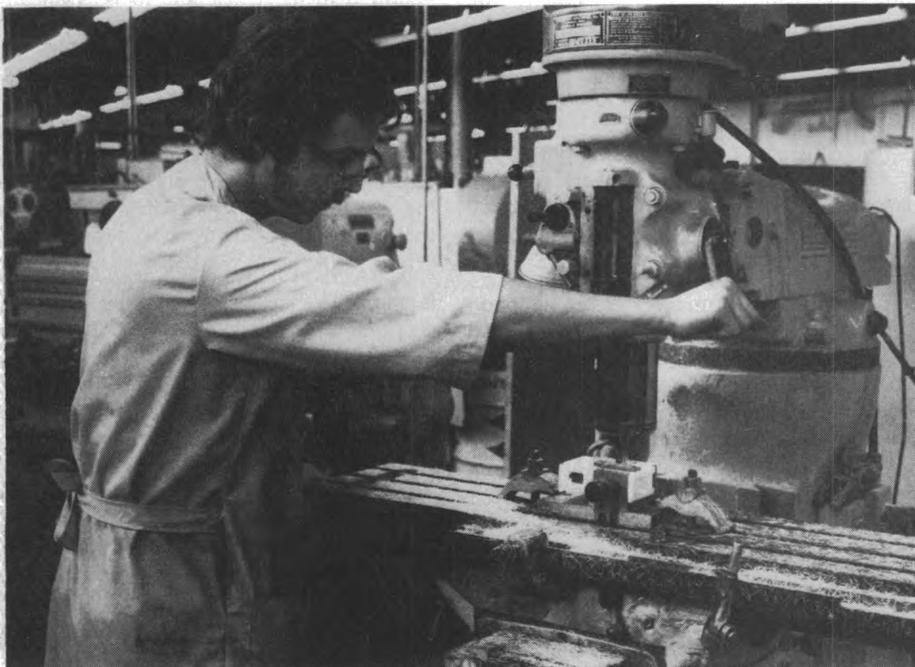
Earnings

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 \$8.53 in 1978. This compares favorably with the average for non-supervisory 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 the accompanying tabulation.

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



Machine tool operators must spend much time on their feet observing machine operations to be sure everything is working smoothly.

Table 1. Average hourly earnings of machine tool operators in selected areas, 1978

| Area | Hourly rate |
|--------------------------------|-------------|
| Detroit | \$9.35 |
| Cleveland | 8.64 |
| Chicago | 8.19 |
| Milwaukee | 8.08 |
| Baltimore | 7.90 |
| Cincinnati | 7.64 |
| Houston | 7.49 |
| Minneapolis-St. Paul | 7.25 |
| Boston | 6.51 |
| Hartford | 6.27 |

SOURCE: Bureau of Labor Statistics.

other machining occupations. These include all-round machinists, setup workers (machine tool), 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*.

Setup Workers (Machine Tools)

(D.O.T. 600.380-014)

Nature of the Work

Machine tools used in shops that do machining in large volume usually are both very large and very complex. Setup workers, often called machine tool job setters, are skilled workers who specialize in preparing these tools for use. Most setup workers work on only one type of machine, such as a drill press or lathe; however, some set up several different kinds.

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 to be machined should 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 or other tools and adjust guides, stops, and other controls.

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 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.

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 wear earmuffs or earplugs to protect their hearing. Good "housekeeping" is emphasized in most shops, which lessens the chances of accidents due to slippery floors or blocked aisles between the machine tools.

Serious work accidents are not common, but machine tools and flying metal particles may cause finger, hand, and eye injuries. To prevent such accidents from occurring, setup workers must follow certain safety rules. Safety glasses and other protective devices must be worn and loose clothing and jewelry are prohibited.

Setup workers do 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.

Places of Employment

In 1978, more than 60,000 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.

Employment 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, cutting sequences, feed speeds, tool se-



Set-up workers prepare machine tools for use by semiskilled operators.

lection, and other operations are controlled by a computer. Most job opportunities will arise from the need to replace experienced workers who retire, die, or transfer to other occupations.

Earnings

The earnings of setup workers compare favorably with those of other skilled machining workers. In 1978, setup workers in metropolitan areas had average earnings of about \$8 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 Occupation

The occupations most closely related to setup worker (machine tool) 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*.

Tool-and-Die Makers

(D.O.T. 601.280-022 and -046), .281-010 and -026, and .381-026)

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 shaved, 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 design 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 manu-

facturing, tool-and-die makers must be familiar with the machining properties, such as heat tolerance, of a wide variety of metals and alloys.

Working Conditions

Tool-and-die makers usually work in "toolrooms," which are in a separate area of the plant off the production floor. Toolrooms usually are quieter than the production floor because there are not as many machines in use at one time. Otherwise, conditions are about the same as those for other machining workers.

Tool-and-die makers must follow strict safety procedures when working around metal-cutting machines. Tool-and-die shops are usually safer than similar operations in production plants.

Places of Employment

About 180,000 tool-and-die makers were employed in 1978. 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 mathematics 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 abilities in mathematics.

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 numer-



Tool-and-die makers are among the most highly skilled of all machinery workers.

ous paths for advancement. Some advance to supervisory and administrative positions in industry. Many tool-and-die makers become tool designers and others may open their own tool-and-die shops.

Employment Outlook

Employment of tool-and-die makers is expected to increase at about the same rate as the average for all occupations through the 1980's. Most openings, however, will occur as experienced tool-and-die makers retire, die, or transfer to other fields of work.

The long-range expansion in metalworking industries will result in a continued need for

tools and dies. The growth of this occupation may 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.

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.

Earnings

Tool-and-die makers are among the highest paid machining workers. In 1978, tool-and-die makers employed in metropolitan areas had estimated earnings of \$8.53 an hour. This was about one and one-half 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 the accompanying tabulation.

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, and setup workers (machine tool).

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*.

Table 1. Average hourly earnings of tool-and-die makers in selected areas, 1978

| Area | Hourly rate |
|---------------------------------|-------------|
| San Francisco-Oakland | \$10.53 |
| Detroit | 9.31 |
| Chicago | 8.98 |
| Cleveland | 8.77 |
| Baltimore | 8.62 |
| Minneapolis-St. Paul | 8.24 |
| Cincinnati | 8.20 |
| Atlanta | 8.17 |
| Boston | 8.03 |
| Houston | 7.55 |
| New York | 7.36 |
| Birmingham | 7.22 |
| Hartford | 7.19 |

SOURCE: Bureau of Labor Statistics.

Printing Occupations

In 1978, about 413,000 printing craft workers were employed to produce newspapers, magazines, business forms, and hundreds of other printed materials. Although most worked for publishers and commercial printing shops, an increasing number had jobs in "in-plant" shops operated by private companies, government agencies, and other organizations that do their own printing. The rapid growth of "in-plant" printing shops from an estimated 25,000 in 1967 to over 70,000 in 1978 has expanded employment opportunities for printing craft workers. However, not all "in-plant" printing shop employees are classified as printing craft workers; information about some of these other jobs is provided in the statement on office machine operators.

Printing craft workers usually specialize in one area of printing operations: Type composition, platemaking, presswork, or binding. The most common way to learn the skills needed in most of these fields is through apprenticeship, which generally lasts from 4 to 5 years. Apprenticeship applicants usually must be high school graduates who are at least 18 years of age, but requirements vary among employers. Most printing craft workers who are covered by union contracts work fewer than 40 hours a week. Some contracts specify a standard workweek of less than 35 hours, but most fall within a 35- to 37-1/2-hour range.

Through the 1980's, opportunities to enter printing crafts will stem mainly from the need to replace experienced workers who retire, die, or leave the field for other reasons. Employment growth also will provide job openings in some crafts, but labor-saving technological developments will restrict growth in others.

The statements that follow deal with employment opportunities for the major groups of printing workers: Compositors, photoengravers, electrotypers and stereotypers, printing press operators and assistants, lithographers, bookbinders, and bindery workers.

Compositors

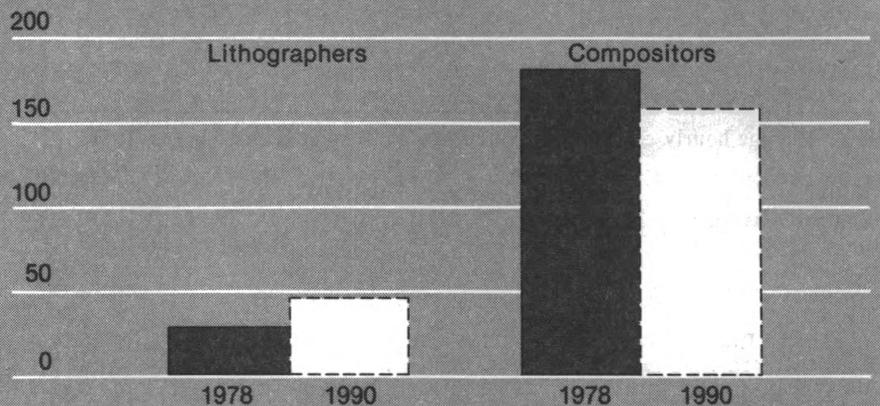
(D.O.T. 650.582-010, 650.582-014, -022, and 973.381-010)

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 work-

Changes in printing technology will increase the demand for lithographers and lessen the need for compositors

Employment (thousands)



Source: Bureau of Labor Statistics

ers who do the actual printing. Compositors insure that the job is completed accurately and on time.

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.

Hand compositors (D.O.T. 973.381-010) make up the oldest composing room occupation. Today, hand typesetting is used only for small 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 "compositing 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 (D.O.T. 650-

582-010) 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 level and the machine automatically fills the molds with 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 (D.O.T. 650.582-014) 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 select 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* (D.O.T. 650.582-022) 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. They then photograph the screen to obtain a film of the material. These machines can prepare entire pages of type and any accompanying pictures instead of a single line of type.

After the copy is set, typesetters pass it to other compositors who arrange the columns of type, pictures, and illustrations according to the desired layout for each page. 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. Either method results in a preliminary printing plate.

After arranging all the pages of a particular job in proper sequence, compositors use a proof press to make a test of 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 and work near noisy machinery.

All compositors may be required to work overtime to meet publication deadlines; some regularly work evenings, or night shifts. Compositors employed by newspapers may work holidays and weekends.

Places of Employment

About 181,000 workers were employed as compositors in 1978. About one-third work 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 cities.

Training and Other Qualifications

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 learning the work on the job.

Training as an all-round skilled compositor is usually obtained through apprenticeship programs. Generally, apprenticeship covers a 4-year period of progressively advanced training, supplemented by classroom instruction or correspondence courses. However, this period may be shortened by as much as 2 to 2 1/2 years for apprentices who have had previous experience or schooling or who show the ability to learn the trade more rapidly. Apprentices may receive intensive training in one or more specialized fields, such as in the operation of phototypesetting machines, as well as in specialized work in hand composition and photocomposition.

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. Artistic ability is an asset for a compositor in layout work. 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.

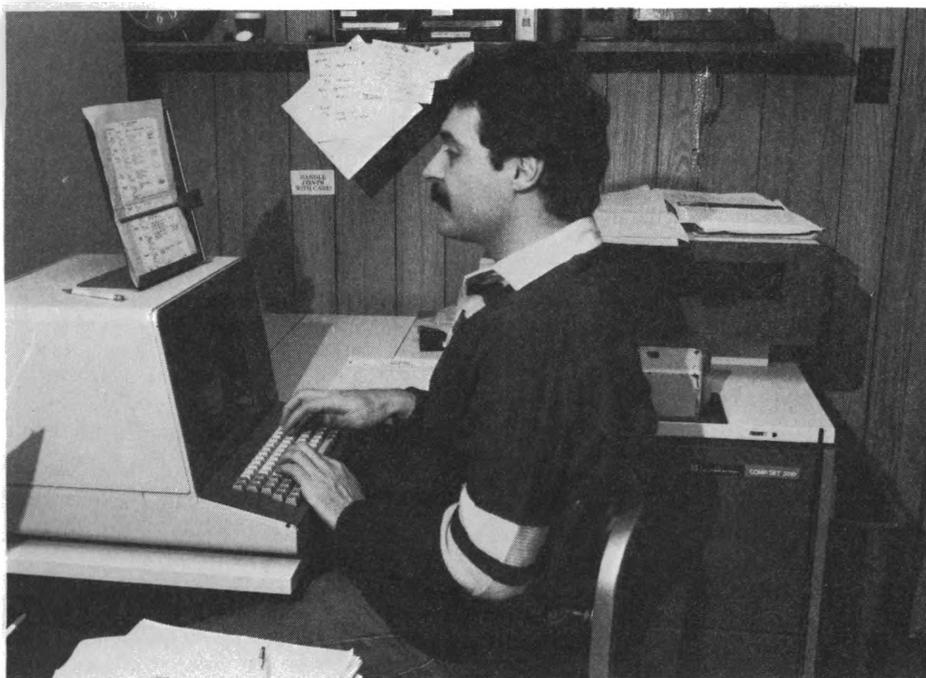
Persons with good typing skills can learn to be phototypesetting machine operators in a relatively short period of time. These workers need not be trained as skilled compositors, but they must be familiar with printing terms and measures.

Employment Outlook

Employment of compositors is expected to decline through the 1980's. Nevertheless, a few thousand job openings are expected each year as experienced workers retire, die, or change occupations.

In spite of the anticipated expansion in the volume of printing, employment of compositors is expected to decline because of the trend to high-speed phototypesetting and typesetting computers. These high-speed machines require fewer operators than the traditional hot-metal method of typesetting. Changes in printing technology are expected to have the greatest impact on compositors employed by newspapers. Thus, employment prospects will be somewhat better for compositors in commercial shops.

For the jobs that do become available, opportunities 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 com-



Compositor operating a phototypesetting machine.

prehensive training that they receive helps them learn composing room trades and adapt to new processes and techniques more readily.

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

Union compositors on the day shift in newspaper plants had an estimated average rate of \$9 an hour in 1978, according to a survey of 69 large cities. Union compositors in commercial shops earned an estimated average minimum rate of \$9.49 an hour. These rates were about one and one-half times the average for nonsupervisory workers in all private industries, except farming. The hourly rate for workers in non-union shops is generally less.

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:

American Newspaper Publishers Association, The Newspaper Center, P.O. Box 17407, Dulles International Airport, Washington, D.C. 20041.

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22209.

Lithographers

Nature of the Work

Lithography, also called offset printing, is one of the most rapidly growing methods of printing. It is a process of photographing the material to be printed, making a printing plate from the photograph, and pressing the inked plate against a rubber plate 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 spe-

cialize in occupations such as camera operator, artist, stripper, and platemaker.

Camera operators (D.O.T. 972.382-014) start the process of making a lithographic plate by photographing and developing negatives of the material. They generally are classified as line camera operators, halftone operators, or color separation photographers. Negatives may need retouching to lighten or darken certain parts. *Lithographic artists* (D.O.T. 972.281-010) 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.

Strippers (D.O.T. 971.281-014) 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* (D.O.T. 971.381-010) 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 photocomposition machine.

Working Conditions

Although lithographers stand most of the time, the work is not physically demanding. Lithographic artists and strippers may find working with fine detail tiring. Platemakers working with toxic chemicals may be expected 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 nights.

Places of Employment

About 28,000 skilled lithographers were employed in 1978. 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 cities.

Training and Other Qualifications

Many lithographers learn the trade through on-the-job training—working as helpers and observing and being taught by experienced lithographers. However, a 4- or 5-year apprenticeship program usually is required in order to become a well-rounded 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.



Employment of lithographers is expected to grow faster than any other printing craft occupations.

Many technical institutes, junior colleges, and colleges offer 2-year programs in printing technology, which provide a valuable background for persons who are interested in learning lithographic crafts. High school and vocational school training in printing, photography, mathematics, chemistry, physics, mechanical drawing, and art also are 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 strippers. A knowledge of electronics is becoming increasingly important because more electronic color scanners are being used for multicolor printing.

Employment Outlook

Employment of lithographers is expected to increase faster than the average for all occupations through the 1980's. In addition to the job openings resulting from employment growth the need to replace workers who retire, die, or change occupations will provide some openings.

Employment of lithographic workers is expected to increase in response to the continued growth of offset printing. Commercial printing firms and newspaper publishers increasingly are using offset printing methods instead of letterpresses. 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.

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

Based on a survey of union wages in 69 large cities, in 1978, estimated average minimum hourly rates for lithographic artists were \$10.40; for strippers, \$10.07; for camera operators, \$10.23; and for platemakers, \$10.01. These rates were about twice the average for all nonsupervisory workers in private industry, except farming.

Many lithographic workers are members of the Graphic Arts International Union.

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:

American Newspaper Publishers Association, The Newspaper Center, P.O. Box 17407, Dulles International Airport, Washington, D.C. 10041.

American Photoplasmakers Association, 556 West 167 St., South Holland, Ill. 60473.

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.

Photoengravers

(D.O.T. 971.261.010, 971.381-014, 971.381-038, 971.382-014)

Nature of the Work

Photoengravers make metal printing plates of pictures and other copy that cannot be set up in type. In letterpress photoengraving, ink is rolled over a printed surface which stands higher than the rest of the plate. When paper is pressed against the 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 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 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 shielded from the light by 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 a small shop, 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 photoengravers work evening and night shifts. Photoengravers employed by newspapers frequently work weekends and holidays.

Places of Employment

An estimated 8,000 skilled photoengravers were employed in 1978. 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 City, Chicago, Philadelphia, and Los Angeles.

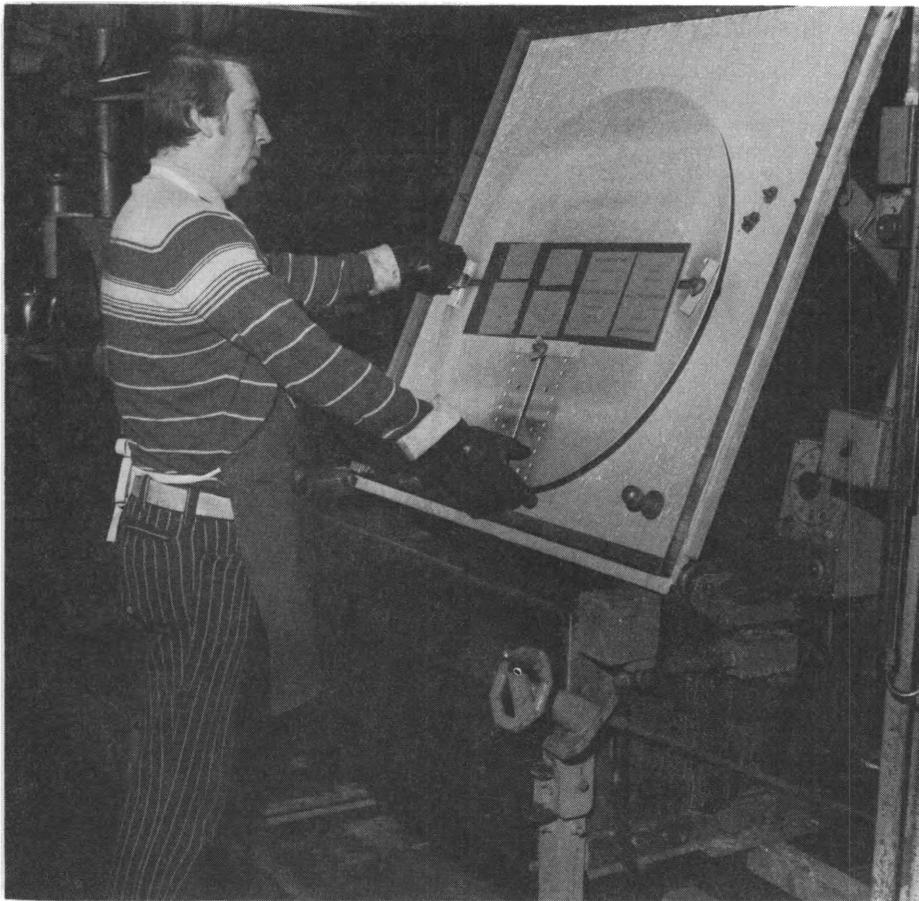
Training and Other Qualifications

Most photoengravers learn their trade through a 5-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. Many employers require a physical examination for prospective photoengravers. Good eyesight is particularly important because of the close work and color determinations involved.

Employment Outlook

Employment opportunities for photoengravers are expected to be scarce in the years



Photoengraver preparing a metal printing plate.

ahead. Despite the growing use of photographs and other illustrations in publications, employment of photoengravers will decline as many firms switch from letterpress to offset printing, which requires no photoengraving. Also, new technological advances, such as color scanners and color enlargers, plus the trend toward automated platemaking should reduce the need for these workers. However, due to the expected growth in gravure printing, there will be some employment opportunities for gravure photoengravers. In addition, some job openings are expected each year as experienced photoengravers retire, die, or leave the occupation for other reasons.

Earnings

Photoengravers on the day shift in newspaper plants earned an estimated average minimum rate of \$9.63 an hour in 1978; photoengravers working the night shift receive extra pay. The average was about two-thirds more than the average for all nonsupervisory workers in private industry, except farming. Most photoengravers are members of the Graphic Arts International Union.

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 above, or the local office of the State employment service.

For general information on photoengravers, write to:

American Newspaper Publishers Association, The Newspaper Center, P.O. Box 17407, Dulles International Airport, Washington, D.C. 20041.

American Photoplatemakers Association, 556 West 167 St., South Holland, Ill. 60473.

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

Graphic Arts International Union, 1900 L St. N.W., Washington, D.C. 20036.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22201.

Electrotypers and Stereotypers

Nature of the Work

Electrotypers (D.O.T. 974.381-010) and *stereotypers* (D.O.T. 974.382-014) make duplicate pressplates of metal, rubber, and plastic for letterpress printing. These plates are

made from the metal type forms prepared in the composing room. Electrotype are 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 papier-mache instead of wax or plastic. The mat is placed on 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.

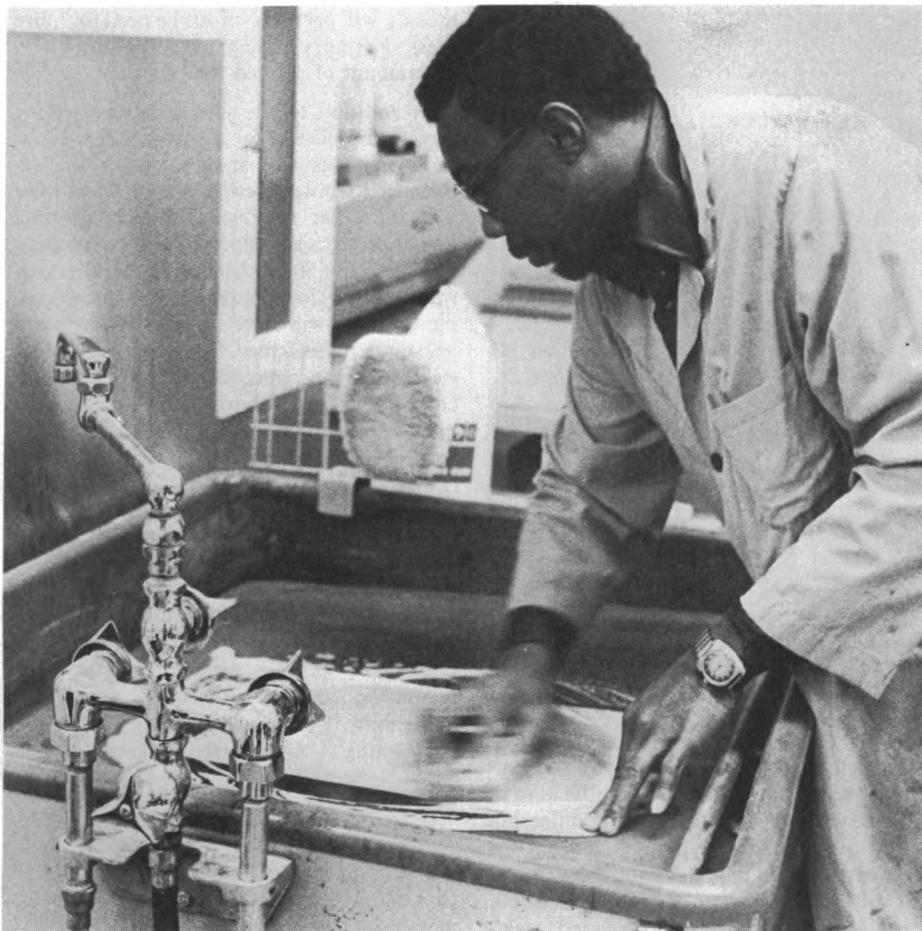
Working Conditions

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 evenings and night shifts. Others may have to work overtime to meet publication deadlines. Stereotypers employed by newspapers frequently work weekends and holidays.

Places of Employment

About 2,000 electrotypers and stereotypers were employed in 1978. 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.



Stereotyper preparing mat for use in a casting machine.

Jobs in these trades can be found throughout the country, but employment is concentrated in large cities.

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 of 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 electroplaters and stereotypers are now being retrained as offset plate makers and press operators.

Employment 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 du-

PLICATE plates. Furthermore, the greater use of offset printing, which eliminates the need for electrotype and stereotype plates, permits photoengravers to do much of the work formerly done by electrotypers.

Earnings

Based on a union wage survey, it is estimated that in 1978 union minimum wage rates in 69 large cities averaged \$8.14 an hour for electrotypers and \$9.17 an hour for stereotypers in book and commercial printing shops. Both averages were considerably higher than the average for all nonsupervisory workers in private industry, except farming.

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 Interna-

tional Printing and Graphic Communications Union, or the local office of the State employment service.

For general information on electrotypers and stereotypers, write to:

American Newspaper Publishers Association, The Newspaper P.O. Box 17407, Dulles International Airport, Washington, D.C. 20041.

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.

Printing Press Operators and Assistants

(D.O.T. 651.382-010 and -014, .482-010, .585-010, and 682-010.)

Nature of the Work

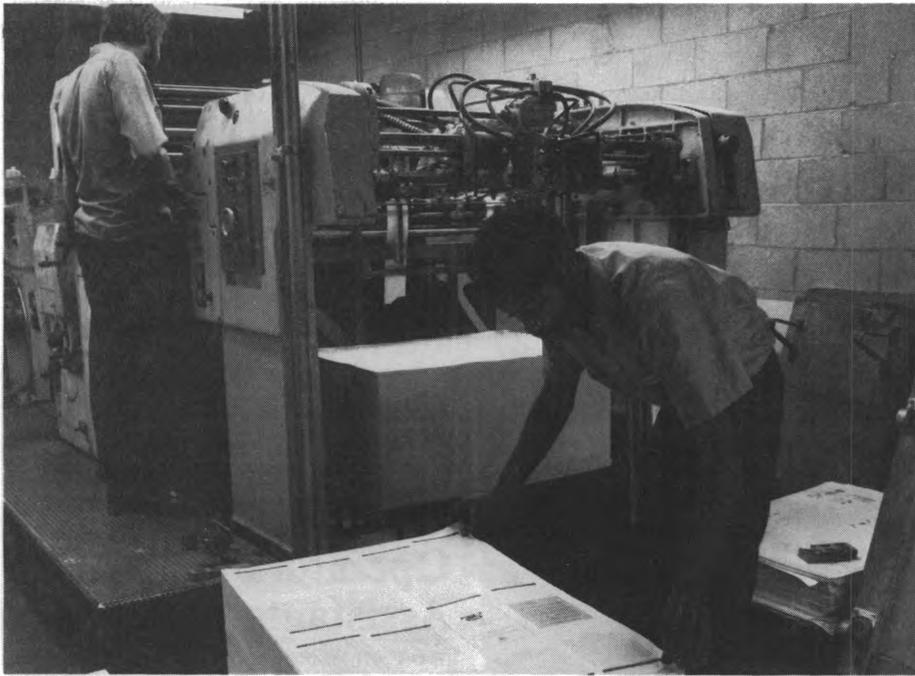
Printing press operators prepare and operate the printing presses in a pressroom.

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 then tighten the locking attachment with a wrench. The operators then level the press-plates 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. 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 newspaper 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



Printing press assistants prepare finished work for shipment to the bindery.

panel. Press operators are generally designated according to the type of press they operate: Letterpress, gravure, or offset.

Working Conditions

Operating a press is a physically demanding job. Press operators are on their feet most of the time and have to do some lifting of 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.

Places of Employment

About 167,000 press operators and assistants were employed in 1978. More than half worked for commercial printing shops and book and magazine publishers. Many others had jobs in newspaper plants. Some press operators and assistants work for banks, insurance companies, manufacturers, and other 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 cities.

Training, Other Qualifications, and Advancement

Most press operators learn their trade through apprenticeship, but some workers 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 press used in the plant. 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 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. Physical strength and endurance are needed for work on some kinds of presses, where operators lift heavy plates and stand for long periods.

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 press 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, or by becoming the press operator-in-charge and being responsible for the work of the entire press crew.

Employment 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 the growth in the amount of printed materials.

In addition to the jobs from created by growth in demand for printing, a few thousand openings will arise each year as experienced workers retire, die, or leave their jobs for other reasons. However, printing press operators are expected to face competition for jobs. Since there are generally long waiting lists for apprenticeship programs, most people will have to take jobs as press assistants or unskilled laborers before being selected for an apprenticeship. It is not uncommon for a person to work 2 or 3 years or more before beginning apprenticeship training.

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

A survey of union wages in 69 large cities, it is estimated that in 1978 indicated that the average minimum hourly rate for newspaper press operators-in-charge was \$9.32; for newspaper press operators, \$8.77; for book and job cylinder press operators, \$8.72; and for book and job press assistants and feeders, \$8.70. These rates were about one and one-half times the average for all nonsupervisory workers in private industry, except farming. The hourly rate for workers in nonunion shops generally is less. Press operators who worked night shifts received extra pay.

Many pressroom workers are covered by union agreements. The principal unions in this field is the International Printing and Graphic Communications Union and the Graphic Arts International Union.

Related Occupations

Other workers who set up and operate production machinery are papermaking machine operators, shoe-making 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 union mentioned above, or the local office of the State employment service.

For general information about press operators and assistants, write to:

American Newspaper Publishers Association, The Newspaper Center, P.O. Box 17407, Dulles International Airport, Washington, D.C. 20041.

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.

Bookbinders and Bindery Workers

Nature of the Work

Many printed items, such as books and magazines, must be folded, sewed, stapled, or bound after they leave the printing shops. Much of this work is done by skilled *bookbinders* (D.O.T. 977.381-010).

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. Bookbinders 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.

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 paper-cutter 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, *bindery workers* (D.O.T. 653-685-010) 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 designing original bindings and special bindings for a small number of copies of a large edition or restoring and rebinding 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.



Bindery workers assembling pages of a pamphlet.

Working Conditions

Many bookbinders work in plants that are hot and poorly lighted, and all plants are very noisy.

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. Long periods of standing and constant use of the arms can be tiring.

Most bookbinders are employed on a full-time basis; many bindery workers work part time or on a temporary basis.

Places of Employment

About 69,000 bookbinders and bindery workers were employed in 1978. Many worked in shops that specialize in bookbinding; others work in the bindery departments of book printing firms, commercial printing plants, and large libraries. Some bookbinders worked for the Federal Government.

Although bookbinders work in all parts of the country, employment is concentrated in large printing centers such as New York City, 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, cutting and trimming machines, for example. 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.

Advancement opportunities generally are limited. In large binderies, skilled bookbinders with considerable experience may advance to supervisors.

Employment Outlook

Employment of bookbinders and bindery workers is expected to increase more slowly than the average for all occupations through the 1980's. Nevertheless, some job openings will arise as experienced 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. Job opportunities are expected to be better for skilled bookbinders than for bindery workers since many tasks that bindery workers used to perform by hand will be done by machine.

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.

Earnings

Average wage rates for skilled bookbinders are below the average for other printing crafts. A survey of union wage rates in 69 large cities indicated that minimum wage rates for bookbinders in publishing firms and bookbinding shops averaged about \$8.55 an hour in 1978. This rate was about one and one-half times the average for all nonsupervisory workers in private industry, except

farming. The hourly rate for bookbinders in nonunion plants is generally less.

Wage rates for bindery workers are considerably lower than the rates for bookbinders, and are among the lowest for printing industry workers. The average minimum hourly rate for bindery workers was \$5.78 in 1978.

Many bindery workers are members of The Graphic Arts International Union.

Related Occupations

Other workers who set up and operate production machinery include papermaking machine operators, shoemaking machine operators, shoemaking 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 International Graphic Arts Union, or the local office of the State employment service.

For general information on bookbinding occupations, write to:

American Newspaper Association, The Newspaper Center, P.O. Box 17407, Dulles International Airport, Washington, D.C. 20041.

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.

Other Industrial Production and Related Occupations

Assemblers

Nature of the Work

When Henry Ford began producing his automobile on an assembly line, modern mass production was born. Workers who before had built 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.

The workers who put together the parts of manufactured articles are called assemblers. Sometimes hundreds work on a single finished product.

Many assemblers work on items that move past their work stations automatically on conveyors. In the automobile industry, for example, one assembler may start 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 make subassemblies. These units are the intermediate steps in the production process; for example, steering columns for automobiles or motors for vacuum cleaners. Others make entire products. Assemblers in rifle manufacturing plants build complete rifles from a collection of parts and subassemblies and then test all the moving parts to be sure they function correctly. Benchwork generally requires the ability to do precise and detailed work. Some electronics assemblers, for example, 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 tanks are put together in this manner. Parts are installed and fastened, usually with bolts, screws, or rivets. Assemblers often use a power tool, such as a soldering iron 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 wire 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 other engineering specifications, and 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 put together electronic equipment 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 from nearby machinery or tools that are used. They may have to lift and fit heavy objects. Workers on assembly lines may be under pressure to keep up with the speed of

the lines. Since most assemblers only perform a few steps in the assembly operation, assembly jobs tend to be more monotonous than other blue-collar jobs.

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.

Places of Employment

About 1,164,000 assemblers worked in manufacturing plants in 1978. More than half were in plants that made machinery and motor vehicles. About half of all assemblers were employed in the heavily industrialized States of California, New York, Michigan, Illinois, Ohio, and Pennsylvania.

Training, Other Qualifications, and Advancement

Inexperienced people can be trained to do most kinds of assembly work in a few days or



Assemblers often must follow detailed instructions.

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.

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 machine 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.

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 ruled defective. Assemblers also may advance to inspector and a few are promoted to supervisor. Some assemblers become trainees in skilled trades such as machinists.

Employment Outlook

Employment of assemblers is expected to grow faster than the average for all occupations through the 1980's, creating thousands of openings each year. Most job openings, however, will result as workers retire, die, or leave the occupation.

More assemblers will be needed in manufacturing plants to meet the increasing demand for consumer products, such as automobiles and household appliances, as well as for industrial machinery and equipment.

Most assemblers work in plants that produce durable goods, such as automobiles and aircraft, which are particularly sensitive to changes in business conditions and national defense needs. Therefore, even though employment is expected to grow, jobseekers may find that job opportunities will vary with the state of the economy.

Earnings

Wage rates for assemblers ranged from about \$3 to \$8 an hour in 1978, according to information from a limited number of union contracts. Most assemblers covered by these contracts made between \$5 and \$6 an hour. Some assemblers are paid incentive or piecework rates, and therefore can earn more by working more rapidly.

Many assemblers are members of labor unions. These 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 United Steelworkers.

Related Occupations

Other occupations which involve handling or assembling things are sewers and stitchers, welders, PBX installers, packers and wrappers, ophthalmic laboratory technicians, checkers, postal clerks, and sorting clerks.

Source of Additional Information

Additional information about employment opportunities for assemblers may be available from local offices of the State employment service.

Automobile Painters

(D.O.T. 845.381-014)

Nature of the Work

Automobile painters make old and damaged motor vehicles "look like new." These skilled workers repaint older vehicles 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 air- or electric-powered sanders and a coarse grade of sandpaper to remove the original paint or rust. Small nicks and scratches that cannot be removed by sanding are filled with body putty. Painters also remove or mask areas they do not want painted, such as chrome trim, headlights, windows, and mirrors.

When the vehicle is ready, painters use a spray gun to apply several primer coats to the surface. Before applying paint, painters adjust the nozzle of the spray gun according to the kind of lacquer or enamel 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 that is sealed to prevent dust and bugs from getting onto the fresh paint. After each coat of primer dries, they sand the surface until it is smooth. Final sanding may be done



Automobile painter uses a spray gun to apply a primer coat.

by hand, using a fine grade of sandpaper. If the surface to be painted is not smooth, the paint job will be rough and uneven. After the final coat of paint has dried, painters or their helpers usually polish the newly painted surface.

Working Conditions

Automobile painters work indoors where they may be exposed to fumes from paint and paint-mixing ingredients. In most shops, however, painting is done in special ventilated booths that protect the painters. Painters also wear masks to protect their noses and mouths. While working painters must bend and stoop to reach all parts of the vehicle.

Places of Employment

About 40,000 persons worked as automobile painters in 1978. Almost three-fourths worked in shops that specialize in automobile 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.

Painters are employed throughout the country, but are concentrated in metropolitan areas.

Training, Other Qualifications, and Advancement

Most automobile painters start as helpers and gain their skills informally by working with experienced painters. Beginning helpers usually perform tasks such as removing trim, cleaning and sanding surfaces to be painted, and polishing the 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 and painting small areas. Becoming skilled in all aspects of automobile painting usually requires 3 to 4 years of on-the-job training.

A small number of automobile painters learn through apprenticeship. Apprenticeship programs, which generally last 3 years, consist of on-the-job training supplemented by classroom instruction in areas such as shop safety practices, proper use of equipment, and general painting theory.

Persons considering this work as a career should have good health, keen eyesight, and a good color sense. Courses in automobile-body repair offered by high schools and vocational schools provide helpful experience. Completion of high school generally is not required but may be an advantage, because to many employers graduation indicates that the person has at least some traits of a good worker, such as reliability and perseverance.

An experienced automobile painter with supervisory ability may advance to shop supervisor. Many experienced painters with the necessary funds open their own shops.

Employment Outlook

Employment of automobile painters is expected to increase faster than the average for all occupations through the 1980's. In addition to jobs created by growth in demand for these workers, many openings are expected to arise each year as experienced painters retire, die, or transfer to other occupations.

Employment of automobile painters is expected to increase primarily because more motor vehicles will be damaged in traffic accidents. As the number of vehicles on the road grows, accident losses will grow, even though better highways, lower speed limits, driver training courses, and improved bumpers and other safety features on new vehicles may slow the rate of growth. Painters also will be needed to repaint older vehicles which have rust or faded paint.

Most persons who enter the occupation can expect steady work because the automobile repair business is not affected much by changes in economic conditions. Job opportunities will be best in heavily populated areas.

Earnings

Painters employed by automobile dealers in 36 large cities had estimated average hourly earnings of \$10.20 in mid-1978, compared to an average of \$5.67 an hour for all nonsupervisory workers in private industry, except farming. Inexperienced helpers and trainees earned substantially less.

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 trainees 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 48 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 painters who are union members 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 fol-

lowing related automotive service occupations: Automobile service advisors, automobile body repairers and customizers, automobile mechanics, and truck and bus mechanics.

Sources of Additional Information

For more details about work opportunities, contact local employers, such as 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 may be a source of information about apprenticeship and other training programs.

For general information about the work of automobile 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.

Blacksmiths

(D.O.T. 610.381-010 and 418.381-010)

Nature of the Work

Years ago the village blacksmith was as vital to a community as the country doctor. No one else could repair a broken wagon wheel, shoe a horse, or forge a tool to suit a farmer's needs. Today, the blacksmith's work still is important in factories and mines where heavy metal equipment must be repaired, and at stables and racetracks. Power hammers and ready-made horseshoes have made much of the work easier, but the basic tasks remain largely the same.

The first thing a blacksmith must do when making or repairing anything made of metal is to heat it in a forge to soften it. Once the metal begins to glow red, it is ready for the blacksmith to pick it up with tongs, place it on the anvil—a heavy, smooth-faced iron block—and begin to shape it using presses and power hammers. On repair jobs, broken parts are rejoined by hammering them together. The blacksmith uses handtools such as hammers and chisels to finish the task at hand, often reheating the metal in the forge to keep it soft and workable.

Before a finished product can be used, it must be hardened. To complete this stage of the process, the blacksmith reheats the metal to a high temperature in the forge and then plunges it into a water or oil bath. However, metal hardened in this way is brittle and can break under stress. If strength is important, blacksmiths temper the metal instead. To do this, they heat the metal to a lower temperature than they use for hardening, keep it hot for some time, and then allow it to cool at room temperature.

Blacksmiths who specialize in shoeing



The first thing a blacksmith does is heat the metal in a forge until it is red hot and malleable.

horses are called farriers. Today, most farriers use ready-made horseshoes so that their primary job is to adjust shoes for a proper fit. On rare occasions, however, they make the shoes themselves. Racehorses need special care because they must withstand strenuous punishment to their legs and hooves. Improper shoeing can permanently damage a valuable horse. Farriers who shoe racehorses need to be able to recognize weaknesses in a horse's legs, and shoe it accordingly. Some horses, for example, need shoes that are thicker on the outside as compared to the inside edge in order to walk correctly. To shoe a horse, farriers begin by removing the old shoe with nail snippers and pincers. They examine the horse's hoof for bruises or other problems, and then clean, trim, and shape the hoof. When the hoof is ready, they position and nail a shoe onto the hoof and finish by trimming the hoof flush to the new shoe.

Working Conditions

Blacksmith shops tend to be hot and noisy, but conditions have improved in recent years because of large ventilating fans and less vibration from new machines. Blacksmiths are subject to burns from forges and heated metals and cuts and bruises from handling tools. Safety glasses, metal-tip shoes, face shields, earplugs, and other protective devices have helped to reduce injuries.

The jobs of some farriers may be seasonal. During the summer months, when horses are ridden more often, farriers may work long hours and even on weekends. Also, those who specialize in shoeing racehorses often work at several different racetracks within their area, and therefore must travel a great deal. In areas where horseracing is seasonal, they may have to move to another State during the off season.

Places of Employment

Of the approximately 11,000 blacksmiths employed in 1978, almost two-thirds worked in factories, railroads, and mines. The remainder worked in small shops, and most were self-employed. Blacksmiths work in all parts of the country—in rural communities as well as in large industrial centers.

Most farriers are self-employed and contract their services to horse trainers at racetrack stables and to owners of horses used for private or public recreation.

Training, Other Qualifications, and Advancement

Many beginners enter the occupation by working as helpers in blacksmith shops or large industrial firms that employ blacksmiths. Others enter through formal 3- or 4-year apprenticeship programs and transfer from related occupations such as hammer operator, press operator, or heat treater. Apprenticeship programs teach blueprint reading, metal properties and heat-treatment of metal, proper use of tools and equipment, and forging methods. Most apprentices are found in large industrial firms rather than in small repair shops. Vocational school or high school courses in metalworking, welding, and blueprint reading are helpful to persons interested in becoming blacksmiths.

Many farriers learn their craft by assisting experienced farriers. Others may take a short course in horseshoeing lasting about 3 or 4 weeks before gaining experience on their own or as farriers' assistants. Courses in horseshoeing are taught in several colleges, as well as at private horseshoeing schools. Persons considering enrolling at a school should talk to a farrier in the area about the school's performance. At least 3

to 5 years of special training or experience are needed to obtain the skills necessary to shoe racehorses.

Farriers who wish to work at racetracks must pass a licensing examination to demonstrate their knowledge of corrective shoeing techniques and the proper shoe to use, depending on the condition of the horse's hoof or leg and the condition of the racetrack. The examination is a performance test and does not require a written examination.

Blacksmiths must be in good physical condition. Pounding metal and handling heavy tools and parts require considerable strength and stamina. Farriers, of course, must have the patience to handle horses.

Opportunities for advancement are limited, especially for blacksmiths who work in small repair shops. However, blacksmiths may advance to be supervisors or inspectors in factories, or decide to open their own repair shops.

Farriers may open their own shops or travel from job to job with a portable forge, if one is needed. Those with sufficient skills to pass a licensing examination may find employment at racetracks.

Employment Outlook

Employment of blacksmiths is expected to decline through the 1980's. Forge shops are using machines to produce many of the metal articles that were formerly handmade by blacksmiths. In addition, welders are doing much of the metal repair work once done by blacksmiths. Nevertheless, some job openings will occur as experienced blacksmiths retire, die, or leave the occupation for other reasons.

Employment of farriers may increase slightly due to the growing popularity of horseracing and the increasing use of horses for recreational purposes. Since this is a small occupation, however, relatively few job openings will become available.

Earnings

In union contracts covering a number of blacksmiths in steel plants and in the shipbuilding and petroleum industries, hourly pay ranged from about \$6 to \$10.76 in 1978. Earnings of blacksmiths in railroad shops averaged \$7.62 an hour in 1978. According to limited information, earnings of farriers who shod saddle horses averaged between \$15,000 and \$20,000 a year in 1978; those who shod racehorses earned up to \$25,000 a year.

Many blacksmiths are members of the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers, and Helpers. Other unions representing blacksmiths include the United Steelworkers of America, the Industrial Union of Marine and Shipbuilding Workers of America, and the International Union of Journeymen Horse-shoers.

Related Occupations

Forge shops workers also shape hot metal with the aid of hammering and pressing machines. Some forging occupations that are similar to blacksmiths include hammersmiths, press operators, up-setters, hammer operators, heaters, and heat treaters. Other occupations that require similar skills and a knowledge of working with metal are welders, boiler-makers, and sheet-metal workers.

All of these occupations are discussed elsewhere in the *Handbook*.

Sources of Additional Information

For details about training opportunities for blacksmiths, contact local blacksmith shops and local offices of the State employment service.

For general career information about the blacksmithing trade contact:

International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers, and Helpers; AFL-CIO, 8th and State Ave., Kansas City, Kan. 66101.

A list of schools that offer horseshoeing instruction and general information about the horseshoeing trade are available from:

International Union of Journeymen Horseshoers, 2917 South Florida Ave., Caldwell, Idaho 83605.

American Farriers Association, P.O. Box 695, Albuquerque, N. Mex. 87103. (Please send a stamped self-addressed envelope.)

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 jobs to do and make sure the jobs are 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 some cases, supervisors also do the same work as other employees. This is especially true in the construction industry where, for example, brick-layer supervisors also lay brick.

Because they are responsible for the output of other workers, supervisors make work schedules and keep production and employee records. They use judgment in planning and must allow for unforeseen problems such as absent workers and machine breakdowns. Teaching employees safe work habits and enforcing safety rules and regulations are other supervisory responsibilities. Supervisors also may demonstrate timesaving or laborsaving 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 workers for wage increases, awards, or promotions; and deal with poor workers by issuing warnings or 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 may have some problems being in the middle between the work force and management. On the other hand, blue-collar worker supervisors may find satisfaction in having more challenging and prestigious jobs than most blue-collar workers.

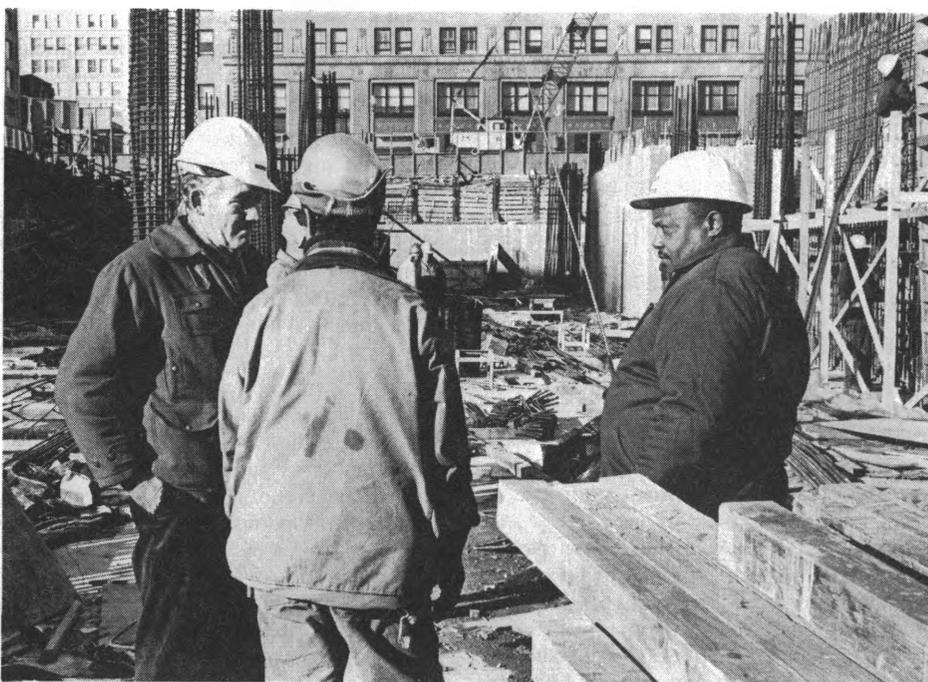
Places of Employment

About 1,670,000 blue-collar worker supervisors were employed in 1978. Although they work for almost all businesses and government agencies, over half of them work in manufacturing, supervising the production of cars, washing machines, and thousands of other products. Most of the rest work 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



Blue-collar worker supervisors tell other workers what jobs are to be done.

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 chemical, 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 college education, may move up to higher management positions. In manufacturing, for example, they may advance to 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.

Employment 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 retire, die, or transfer to other occupations.

Population growth and 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.

Earnings

In 1978, average annual earnings of blue-collar worker supervisors who worked full time were about \$18,000, approximately one and one-half times the average for all non-supervisory 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 Association, 135 West 50th St., New York, N.Y. 10020.

Boilermaking Occupations

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, with allowances for 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 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. 805.361-014) 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, boil-

ers 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 conditions. 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 blow 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 eliminate injuries, employers and unions actively promote safety programs and the use of protective equipment, such as safety glasses and metal helmets.

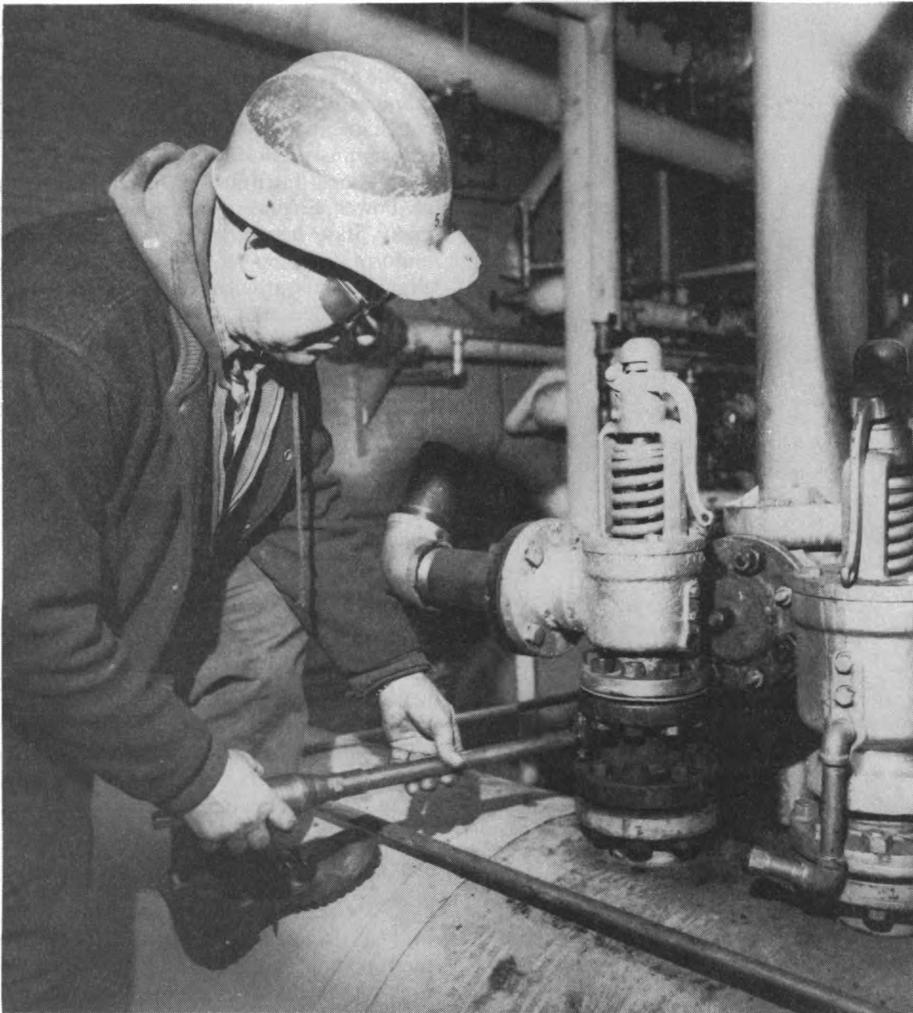
Places of Employment

About 37,000 boilermakers, layout workers, and fitters were employed in 1978. Of these, several thousand boilermakers worked in the construction industry, mainly to assemble and erect boilers and other pressure vessels. Boilermakers also were employed in the maintenance and repair departments of iron and steel plants, petroleum refineries, railroads, shipyards, and electric powerplants. Large numbers worked 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.

Boilermaking workers are employed throughout the country, but employment is concentrated in highly industrialized areas, such as New York, Philadelphia, Chicago, Pittsburgh, Houston, San Francisco, and Los Angeles.

Training, Other Qualifications, and Advancement

Many people have become boilermakers by working for several years as helpers to experienced boilermakers, but 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



Many boilermakers do maintenance and repair work.

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. Otherwise, they may be laid off and the program take longer than 4 calendar years.

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.

Employment Outlook

Employment in boilermaking occupations is expected to increase faster than the average for all occupations through the 1980's. In addition to job openings from employment growth, other openings will arise each year as experienced workers retire, die, or transfer to other fields of work.

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 petroleum refining industries, will further increase the demand for these workers. Also, more boilermakers will be needed to install pollution control equipment if further pollution control legislation is enacted.

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 others 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 \$11.55 an hour in 1978, compared with \$10.63 for all building trades. 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. Boilermakers employed in railroad shops averaged about \$7.90 an hour in 1978.

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 \$6 to \$12 in 1978.

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.

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, sheet-metal workers, tool-and-die makers, and welders.

Sources of Additional Information

For further information regarding boiler-making 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.

Boiler Tenders

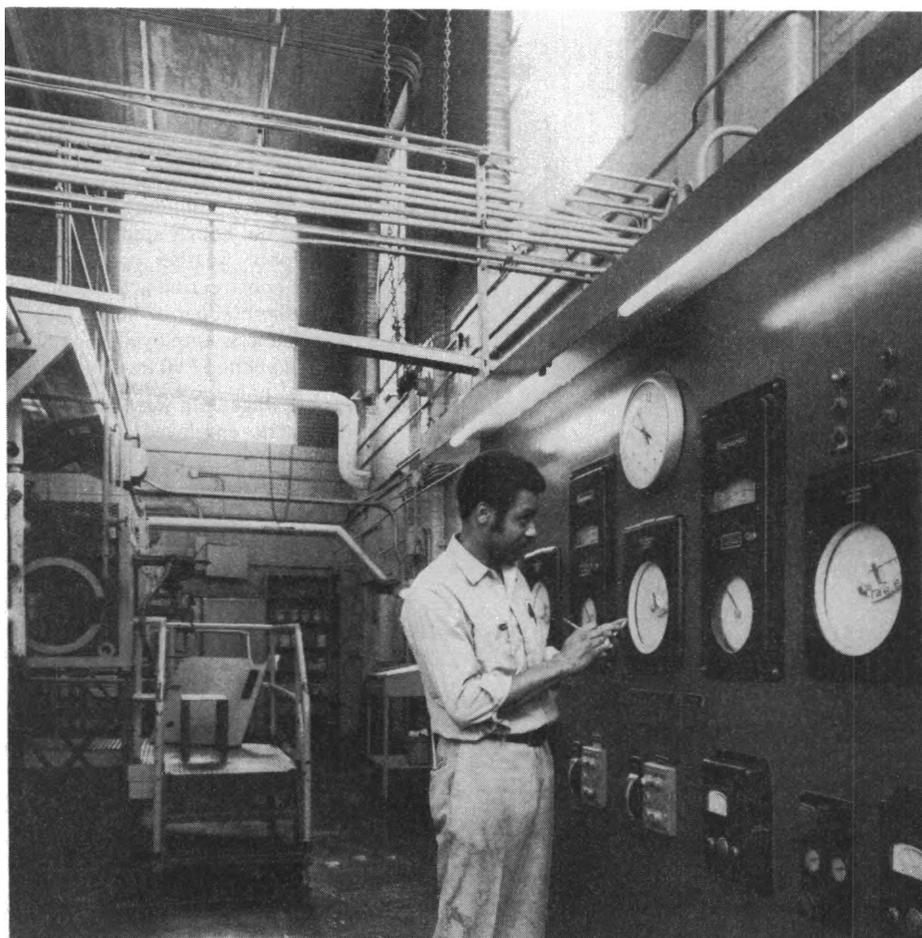
(D.O.T. 951.685-010 and -014)

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 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.

These workers inspect and maintain boiler



Boiler tenders read meters and gauges attached to boilers to insure safe operation.

equipment. Their work includes reading 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. (Additional 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.

Places of Employment

About one-half of the 71,000 boiler tenders employed in 1978 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. Public utilities also employ

many of these workers. Many others work in hospitals, schools, and office and apartment buildings.

Although boiler tenders are employed in all parts of the country, most work in the more heavily populated areas where large manufacturing plants are located.

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 boiler tenders.

There are two types of boiler tenders' licenses—for low-pressure and high-pressure boilers. Low-pressure tenders operate boilers generally used for heating buildings. High-pressure tenders operate the more powerful boilers and auxiliary boiler equipment used to power machinery in factories as well as heat large buildings, such as high-rise apartments. Both high- and low-pressure tenders, however, may operate equipment of any pres-

sure 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 eliminate this problem by establishing 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.

Employment Outlook

Little change in employment of boiler tenders is expected through the 1980's as more new boilers are equipped with automatic controls. Nevertheless, a few thousand openings will result each year from the need to replace experienced tenders who retire, die, or transfer to other occupations.

Earnings

Boiler tenders had average hourly earnings of \$6.69, according to a survey of metropolitan areas in 1978. This was higher than the average for all nonsupervisory workers in private industry, except farming. The average for tenders ranged from \$4 in the San Antonio, Tex. metropolitan area to \$8.42 in the Seattle, Wash. metropolitan area.

The principal unions to which boiler tenders belong are the International Brotherhood of Firemen and Oilers and the International Union of Operating Engineers.

Related Occupations

Boiler tenders monitor and check steam boiler equipment which generates power for industrial machinery. Others whose work requires 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.

Electroplaters

(D.O.T. 500.362-010 through .684-010)

Nature of the Work

Electroplating is a commonly used manufacturing process that gives metal or plastic articles a protective surface or an attractive appearance. Products that are electroplated include items as different as automobile bumpers, silverware, costume jewelry, and jet engine parts. In all cases, however, the object being plated is connected to one end of an electric circuit and placed in an appropriate solution. The other end of the electric circuit is connected to the plating material. By controlling the amount of electricity that flows from the plating material through the solution to the object being plated, electroplaters control the amount of chromium, nickel, silver, or other metal that is applied to the final product.

Prior to electroplating any object, electroplaters study the job specifications which indicate the parts of the objects to be plated, the type of plating metal to be applied, and the desired thickness of the plating. Following these specifications, they prepare the plating solution by carefully adding the proper amounts and types of chemicals.

In preparing an item for electroplating, platers may first cover parts of it with lacquer, rubber, or tape to keep these parts from being exposed to the plating solution. They then either scour the article or dip it into a cleaning bath to remove dirt and grease before putting it into the solution.

Electroplaters must carefully inspect their work for defects such as minute pits and nodules. They may use a magnifying glass to examine the surface and micrometers and calipers to check the plating thickness.

Skill requirements and work performed vary by type of shop. All-round platers in small shops analyze solutions, do a great variety of plating, calculate the time and electric current needed for various types of plating, and perform other technical duties. They also may order chemicals and other supplies for their work. Platers in larger shops usually carry out more specialized assignments that require less extensive knowledge.

Working Conditions

Electroplaters stand most of the time while they work. They also have to do a lot of reaching, bending, and carrying. Although mechanical equipment is generally used for lifting, the platers often have to lift by hand objects weighing as much as 100 pounds.

There are many occupational hazards associated with plating work such as the risk of burns from splashing acids and the inhalation of toxic fumes. Dampness and unpleas-

ant odors also are part of the undesirable working conditions in electroplating plants. However, most plants have ventilation systems and other safety devices that reduce occupational hazards. Protective clothing and boots provide additional safeguards.

Places of Employment

About 40,000 people worked as electroplaters in 1978. About half of them worked in job shops that specialized in metal plating and polishing for manufacturing firms and other customers. Virtually all of the remaining platers worked in plants that manufactured automobile bumpers, plumbing fixtures, cooking utensils, household appliances, electronic components, motor vehicles, and other metal products. The Federal Government employed a few platers for maintenance purposes at a number of military and civilian installations.

Electroplaters work in almost every part of the country, although most work in the Northeast and Midwest, near the centers of the metalworking industry. Large numbers of electroplaters work in Los Angeles, San Francisco, Chicago, New York City, Detroit, Cleveland, Providence, and Newark.

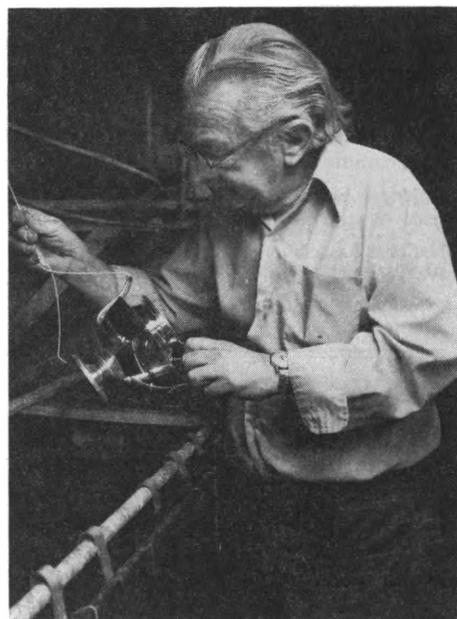
Training, Other Qualifications, and Advancement

Most electroplaters learn the trade on the job by helping experienced platers. It usually takes at least 3 years to become an all-round plater. Platers in large shops usually are not required to have an all-round knowledge of plating and can learn their jobs in much less time. However, workers who receive such limited training generally have difficulty in transferring to shops doing electroplating with metals outside their specialty.

While a high school diploma is not essential for entry, high school or vocational school courses in chemistry, electricity, physics, mathematics, and blueprint reading are helpful.

A small number of electroplaters receive all-round training by working 3 or 4 years as an apprentice. Apprenticeship programs combine on-the-job training and related classroom instruction in the properties of metals, chemistry, and electricity as applied to plating. Apprentices do progressively more difficult work as their skill and knowledge increase. By the third year, they determine cleaning methods, do plating without supervision, make solutions, examine plating results, and direct helpers. One- or two-year electroplating courses are available in junior colleges, technical institutes, and vocational high schools. In addition, many branches of the American Electroplaters Society give basic courses in electroplating.

Qualified platers may become supervisors. Some may become sales representatives for metal products wholesalers or manufacturers. Electroplaters with the necessary capital may go into business for themselves.



Electroplaters must inspect their work for flaws.

Employment Outlook

Little change is expected in employment of electroplaters through the 1980's. Most openings will result from the need to replace experienced workers who retire, die, or leave the occupation for other reasons.

Although there will be a continuing need for electroplating, employment growth will be restricted by the increasing application of automated plating equipment. In addition, stricter water quality standards established by the Environmental Protection Agency will require plants to install expensive equipment. This could cause the closing of less efficient plating operations.

Earnings

Hourly wage rates for experienced electroplaters ranged from about \$5 to \$8 in 1978, according to the limited information available. Entry level rates ranged from \$3.75 to \$4 an hour.

Some platers are members of the Metal Polishers, Buffers, Platers and Helpers International Union. Other platers have been organized by the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America, and the International Association of Machinists and Aerospace Workers.

Related Occupations

Electroplaters finish metal products. Others who work with or finish metals are heat treaters, jewelers, metal finishers, metal molders, metal sprayers, patternmakers, photoengravers, and silversmiths.

Source of Additional Information

Information on the availability of apprenticeships or on-the-job training may be obtained from State employment offices and

local union offices. Training opportunities may also be located by contacting manufacturing plants and job shops that do electroplating.

For more specific information about job opportunities and training, write to:

American Electroplaters Society, Inc., 1201 Louisiana Ave., Winter Park, Fla. 23609.

National Association of Metal Finishers, 111 East Wacker Dr., Chicago, Ill. 60611.

Forge Shop Occupations

Forging is one of the oldest methods of working and shaping metals. The exceptional strength of forged metal parts makes this an often used method of forming products that must withstand heavy wear. Many machine tools, such as wrenches and drill bits, are forged because they are subjected to constant stress and pressure.

The simplest forging method is hand forging done by a blacksmith. Modern forge shops, however, substitute heavy power equipment and dies (tools that shape metal) for the blacksmith's hammer and anvil. In this way, products can be forged in much greater quantity. 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 metals also are forged. Nonferrous forgings are useful in many critical applications, for example, aircraft landing gear. Some of the advantages of nonferrous metal forgings are corrosion resistance 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 piece of industrial machinery.

Nature of the Work

Before metal can be shaped, it must be heated intensely hot furnaces (forges) until it is soft. 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. To finish the forging, other workers remove rough edges and excess metal and perform other finishing operations such as heat treating and polishing.

Two kinds of dies are used. The open die, which is flat and similar to the blacksmith's hammer, is used when only a limited quantity of forgings or large-size, simple-shaped forgings are needed. 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 var-

ious types of hammers, presses, dies, upsetters, and furnaces. Forge shop workers also use handtools, such as hammers and tongs, 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 desired angles and curves. They decide the amount of hammer force and if and when the metal needs additional heating.

Hammersmiths 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. The rest of the crew consists of one or more helpers to assist as needed.

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. Generally the parts forged by closed die hammers are more intricate and detailed, thus these operators are highly skilled. With the assistance of a crew of helpers and heaters, hammer operators set and align dies in the hammers. They correctly position the metal under the hammer, control the force of the forging blow, and determine if and when the metal needs additional heating to make it easier to shape the metal to that of 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 the operators regulate machine pressure and move the hot metal between the dies. They also may control the metal heating operations. Some operators set up the dies in the presses, using instruments such as squares and micrometers to make sure these are in place. 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 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 the impression dies for the forging hammers and presses. Working from a blueprint, drawing, or template, these skilled workers make an outline of 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 and smooths 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 forgings and then allow them to cool, which hardens and tempers the metal.

Working Conditions

Forge shop occupations are more hazardous than most manufacturing occupations. However, improvements in machinery and shop practices have reduced some 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 required use of protective equipment such as face shields, ear plugs and muffs, safety glasses, metal-toed 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.

Places of Employment

In 1978, about 74,000 production workers were employed in forge shops. About two-thirds of these worked in shops that make and sell forgings. The remainder worked in plants that use forgings in their final products, such as plants operated by manufac-



Before metal can be shaped, it must be heated until it glows.

turers of automobiles, farm equipment, and handtools. 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 the cities of Detroit, Chicago, Cleveland, Los Angeles, 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, requires several years of on-the-job training and experience.

Some forge shops offer apprenticeship training programs for skilled jobs such as die-sinker, heat treater, hammer operator, hammersmith, and press operator. These programs usually last 4 years, and offer classroom training and practical experience in metal properties, power hammer and furnace operation, handtool use, and blueprint reading.

Training requirements for inspectors vary. Only a few weeks of on-the-job training are necessary for those who examine

forgings visually or use only simple gauges. Others who inspect forgings that must meet exact specifications may need some background in blueprint reading and mathematics, and may be given several months of training.

Employers usually do not require a high school diploma, but graduates may be preferred. Persons interested in more skilled forge shop jobs should complete high school and take mathematics (especially geometry), drafting, and shopwork.

Employment 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 automobile and energy-related industries. Many forged 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.

Earnings

Average hourly earnings of forge shop production workers are higher than the average for all manufacturing production workers. In 1978, production workers in iron and steel forging plants averaged \$8.03 an hour, compared to \$6.17 an hour for production workers in all manufacturing industries.

Most forge shop workers are union members. Many belong to the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers. 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

The occupations most closely related to the forging occupations are, of course, the 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. Freeport Road, Pittsburgh, Pa. 15238.

Inspectors (Manufacturing)

Nature of the Work

Most products—including the things we eat, drink, wear, and ride in—are checked by inspectors during the manufacturing process to insure that they meet quality standards and specifications. Inspectors also check the raw materials and parts that make up finished goods.

Inspectors use a variety of methods to make certain that products meet specifications. They may taste-test a soft drink; examine a jacket for defects; or use micrometers, protractors, gauges, and magnifying glasses to make sure that airplane components are

assembled properly. Inspectors frequently make simple calculations to measure parts and examine work orders or blueprints to verify that products conform to standards.

Inexperienced inspectors usually work under close supervision. More senior inspectors generally have less supervision; they usually have authority to accept or reject products; and some analyze the reasons for faulty construction and recommend corrective action. Skilled inspectors usually know how to use a variety of complex testing instruments. In assembling large, complicated products such as automobiles, airplanes, and electrical equipment, for example, skilled inspectors use automatic gauges and computers to assure that production standards are maintained within safe and precise tolerance levels.

Some inspectors make minor repairs and adjustments, such as filing a rough edge or tightening a bolt. They may also grade products for quality. Where proper performance is critical, for example in nuclear reactor parts or missile components, inspectors examine each part individually; for other parts, such as spark plugs they only inspect sample items.

Working Conditions

Working conditions vary considerably depending on the parts, products, or processes to be examined.

Inspectors who work on the production floor of machinery or metal fabricating plants may be exposed to high temperatures, oil, grease, and noise. Other inspectors, however, work while sitting in clean, quiet, air-conditioned workplaces.

Places of Employment

About 736,000 inspectors were employed in 1978. More than two-thirds worked in plants that produced durable goods such as machinery, transportation equipment, electronics equipment, and furniture. Others worked in plants that produced nondurable goods such as textiles, apparel, and leather products.

Inspectors worked in every part of the country, although they were concentrated in the industrialized States. The majority of these workers are employed in Ohio, Pennsylvania, Illinois, California, Michigan, Indiana, New Jersey, and North Carolina.

Training, Other Qualifications, and Advancement

Inspectors generally are trained on the job—from a few hours or days to several months, depending upon the skill required.

Employers look for applicants who have good health and eyesight—with or without glasses—who can follow directions, concentrate on details, and perform repetitive tasks

accurately. Also, manual dexterity is needed. Applicants should be able to get along with people since inspectors occasionally work as part of a team. A few large companies give pre-employment tests to check skills such as the ability to work with numbers. Some employers may hire applicants who do not have a high school diploma but who have qualifying aptitudes or related experience. Other employers prefer experienced workers for inspection jobs. Many inspectors acquire the necessary skills and experience by working at various production line jobs, especially assembling.

Inspectors in entry level jobs, after gaining experience and perhaps studying blueprint reading and shop mathematics, usually can advance to more highly skilled inspection work. Some go on to become inspection supervisors or quality control technicians.

Employment Outlook

Employment of inspectors is expected to increase about as fast as the average for all occupations through the 1980's. As population and personal incomes grow, most manufacturing industries are expected to increase their output and thus to employ more inspectors. Additionally, the growing complexity of manufactured products should result in a need for more skilled inspectors as companies emphasize improved quality. Many openings will result as workers retire, die, or transfer to other occupations.

Employment of inspectors may fluctuate from year to year since they are concentrated in firms that produce durable good. Production of these items is particularly sensitive to changes in business conditions.

Earnings

Wages for inspectors ranged from \$3.85 to \$8.68 an hour in 1978, according to information from a limited number of union contracts.

Many inspectors are members of labor unions, including the International Union, United Automobile, Aerospace and Agriculture Implement Workers of America; the International Association of Machinists and Aerospace Workers; the International Union of Electrical, Radio and Machine Workers; the International Brotherhood of Electrical Workers; United Steelworkers; and the Allied Industrial Workers of America.

Related Occupations

Inspectors examine manufactured goods for flaws and to control quality. Others who test the reliability and quality of materials are bridge inspectors, elevator examiners and adjusters, quality control technicians, auto repair service estimators, petroleum inspectors, water quality testers, agricultural commodity inspectors, building inspectors, and weights and measures inspectors.



Inspectors insure that products meet quality standards and specifications.

Sources of Additional Information

Information about employment opportunities in this field may be available from State employment service offices.

The American Society for Quality Control certifies quality technicians. They also publish a booklet called "Careers in the Quality Sciences," which describes the occupation of inspector and includes information on quality engineering and management careers as well. For information about the test required for certification, or for a free copy of the booklet, write to:

American Society for Quality Control, 161 West Wisconsin Ave., Milwaukee, Wis. 53203.

Millwrights

(D.O.T. 638.281-018)

Nature of the Work

With the coming of the Industrial Revolution, machines replaced many handcrafted items and new and bigger factories became necessary. The textile industry in England was one of the first to use machinery to mass produce its goods. The workers who planned and built these 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 all types of machinery in almost every industry.

The millwright is a skilled craft worker who may perform any or all of the tasks involved in preparing machinery for use in plants. This often includes construction of concrete foundations or wooden platforms on which heavy machines are mounted. As they either personally prepare or supervise the construction of these structures, millwrights must know how to read blueprints and work with various building materials.

Millwrights also may dismantle existing equipment when it becomes obsolete or to make better use of factory space. To loosen and disassemble parts, they use wrenches, hammers, pliers, metal cutting torches, and other hand and power tools.

To aid in moving machinery, the millwright may use any number of rigging devices. For example, to install a new oven in a food processing plant, millwrights may use a hoist or a small crane to move the oven from the truck on which it arrived to a conveyor which would carry it into the plant. Then it may be lifted, with the aid of a crowbar for leverage, onto a dolly and taken to a foundation for proper positioning.

In assembling machinery, millwrights fit bearings, align gears and wheels, attach motors and connect belts to prepare a machine for use. Mounting and assembling a piece of equipment requires tools similar to those used in the dismantling process. When precision leveling is necessary, measuring devices



Millwrights install and check all types of machinery in plants.

are used. To set up automatic pin-setting equipment in a bowling alley, for example, plumb bobs—or weights which determine perpendicularity—must be attached. Millwrights also use squares to test right angles and calipers to measure diameter and thickness.

Many of the millwright's duties also are performed by industrial machinery repairers. (See the statement on industrial machinery repairers elsewhere in the *Handbook*.) This includes preventive maintenance, such as oiling and greasing, and fixing or replacing worn parts.

Millwrights employed by contract installation and construction companies do a variety of installation work. Those employed in factories usually specialize in installing the particular types of machinery used by their employers. They also may maintain plant equipment such as conveyors and cranes.

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. Frequently these millwrights must travel.

Millwrights are subject to usual shop haz-

ards 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. Accidents have been reduced by the use of protective devices such as safety belts and hats, however.

Places of Employment

Most of the estimated 95,000 millwrights employed in 1978 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

Some 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 which combine on-the-job training with classroom instruction. Appren-

ticeship programs include training in dismantling, moving, erecting, and repairing machinery. Helpers 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. Some employers prefer to hire high school or vocational school graduates. Courses in science, mathematics, mechanical drawing, and machine shop practice are useful. Because millwrights often put together and take apart complicated machinery, mechanical aptitude is important. Strength and ability also are important, because the work requires a considerable amount of lifting and climbing.

Employment 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 from growth in the demand for millwrights, many openings will arise annually as experienced millwrights retire, die, or transfer to other occupations.

Earnings

According to a survey of metropolitan areas, hourly wages for millwrights averaged \$8.72 in 1978—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 the accompanying tabulation.

Most millwrights belong to labor unions, among which are the International Association of Machinists and Aerospace Workers; United Brotherhood of Carpenters and Joiners of America (construction millwrights); United Steelworkers of 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 to assemble, disassemble, and in some cases repair machinery. Other workers with similar job duties are elevator constructors, industrial machinery repairers, iron workers, machine assemblers, machinists, 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, or local firms that employ millwrights.

Motion Picture Projectionists

(D.O.T. 960.362-010)

Nature of the Work

Working as key behind-the-scenes personnel, projectionists operate the movie projectors and sound equipment in theaters. Because the type of equipment differs from theater to theater, they must be able to handle a variety of duties.

In theaters with older equipment, projectionists use two projectors, sound equipment, a film rewinding machine, and seven reels of film or more. Before the movie begins, they examine the film, check the equipment to see that it works properly, and load the projectors with the first and second reels. After adjusting the extremely bright projector lamp which provides light for the screen, projectionists start the first reel. If the picture is out of focus or unsteady, they adjust the projector lens. Volume controls also may be adjusted if the sound is too loud or too soft.

A reel of film lasts 20 minutes or more. When the reel is almost complete, cue marks (small circles in the upper right corner of the picture) signal that it is time to start the second projector. After a second series of cue

marks appears, the projectionist simultaneously closes the shutter on the first projector and opens the second one. This changeover happens so quickly that the audience does not notice an interruption on the screen. Next, the projectionist removes the first reel and rewinds it on the rewinding machine. The entire process is repeated until all the reels have been shown. If the film breaks, the projectionist must rethread it rapidly so that the show may continue.

Almost all new theaters and many renovated theaters have automated or semiautomated equipment. When the film is properly programmed or "set up," the machines automatically can dim houselights, open curtains, start the show with picture and sound, change from one projector to another, and rewind the film. This equipment also uses larger reels, which lessens the number of projector changeovers.

In theaters that have this automated equipment, the projectionist's main job is the "set up" of the film because a movie comes from a film exchange company on seven to twelve individual reels of film. To set up the film, the projectionist must splice it from these reels and rewind it on two to three reels or on one "platter." The projectionist also cues the program by placing small metallic tabs on the film that will activate the various functions of the machinery, such as the film changeover, when the film is run. The film must then be carefully inspected for flaws, which may cause the film to break during the showing.

In case of trouble, such as a break in the film, the equipment shuts off until the projectionist can correct the problem. When a movie has finished its run in a theater, the projectionist must cut the film to fit on the smaller reels before returning it to the film exchange company.

Projectionists also clean and lubricate equipment, check for defective parts and damaged film, and make minor repairs and adjustments. For example, they may replace a badly worn projector sprocket. Major repairs usually are made by service technicians who specialize in repairing projection and sound equipment. However, employers sometimes seek a projectionist who can do all the repair work.

Working Conditions

Most projectionists work 4 to 6 hours on weekday evenings and 10 hours or more on Saturday or Sunday. In theaters with weekday matinees, projectionists usually work 6 hours a day, 6 days a week. Some projectionists work at several theaters. For example, a weekly schedule may call for two evenings in each of three theaters. In small towns, projectionists usually work only part time because of the small number of shows. Projectionists employed at drive-ins—particularly in northern States—may be laid off for several months during the winter.

Projection rooms usually have adequate

Table 1. Average hourly earnings of millwrights in selected areas, 1978.

| Area | Hourly rate |
|--------------------------------|-------------|
| Indianapolis | \$9.48 |
| Detroit | 9.19 |
| Atlanta | 9.05 |
| Houston | 8.95 |
| Baltimore | 8.84 |
| St. Louis | 8.60 |
| Chicago | 8.56 |
| Cincinnati | 8.45 |
| Minneapolis-St. Paul | 8.02 |
| Boston | 6.74 |

SOURCE: Bureau of Labor Statistics.

lighting and ventilation, and some are air-conditioned. The work is not strenuous and is relatively hazard free, but there is danger of electrical shock and acid burns from the projector's lamp if proper safety precautions are not taken. Although projectionists must stand a lot, they may sit for short periods while the equipment is operating. Most projectionists work without direct supervision and have infrequent contact with other theater employees.

Places of Employment

An estimated 11,000 motion picture projectionists were employed full time in 1978. The majority worked for indoor theaters; most of the remainder worked for drive-ins. Some projectionists worked for large manufacturing companies, colleges, television studios, and Federal, State, and local governments.

Projectionists work in every section of the country. Geographically, employment is distributed about the same as population.

Training, Other Qualifications, and Advancement

Most theaters in urban areas are unionized, and young people seeking jobs as projectionists generally must meet union membership requirements. The union locals establish these membership requirements, and they vary considerably among the locals. In nonunion theaters young people may start as ushers or helpers and learn the trade by working with an experienced projectionist.

Generally, unions prefer that applicants be high school graduates. In a few cities and States, projectionists must be licensed. The license often must be obtained before applying for union membership.

Several locals only admit applicants who have had experience with projection equipment. These applicants may work for a trial period in several theaters under the supervision of the regular projectionist. If they demonstrate an adequate knowledge of the projection equipment and its operation, they may join the union. The trial period usually lasts several weeks, and during that time the applicant receives no pay.

Some locals conduct training programs, which usually do not require previous experience with projection equipment. Trainees learn the trade by working with projectionists. They first learn simple tasks, such as threading and rewinding film and progress to more difficult assignments such as adjusting and repairing equipment. A trainee often works in several theaters to become familiar with different types of equipment. Some training programs include classroom instruction in basic electronics and mechanics. After training, the applicant must pass a written exam about equipment use and maintenance; the applicant then becomes a union member. Trainees are not paid for their work in the theaters.

Persons interested in becoming projectionists should have good eyesight—including normal color perception—and good hearing. They should be temperamentally suited to working alone. Manual dexterity and mechanical aptitude also are important qualifications. High school courses in mechanics and electronics or practical experience gained from operating 16-millimeter projectors at school or in the Armed Forces is helpful.

Advancement opportunities for projectionists are limited. Some, however, become projectionist-managers and run many of the

theater's daily operations.

Employment Outlook

Little change is expected in employment of motion picture projectionists through the 1980's. Most job openings will occur as experienced workers retire, die, or transfer to other fields of work. Applicants may face keen competition for the jobs that become available. Because earnings of motion picture projectionists are relatively high, applicants frequently outnumber job openings. In some areas, new union members may only be able to work part time as replacements for full-time projectionists.

The number of movie theaters is expected to increase more slowly than in recent years, because lack of new films will hurt the theaters' ability to compete with other forms of entertainment such as television. Furthermore, because of laborsaving innovations in equipment and theater design, employment of projectionists will not keep pace with the increase in theaters. While older theaters had one screen and employed at least one projectionist, most new theaters are built with several screens side by side so that one projectionist, aided by automated projection machines and longer film reels, can run films for more than one auditorium at a time. The replacement of single-screen theaters by those with multiple screens will slow the growth of employment for projectionists, even though new theaters will be constructed.

Earnings

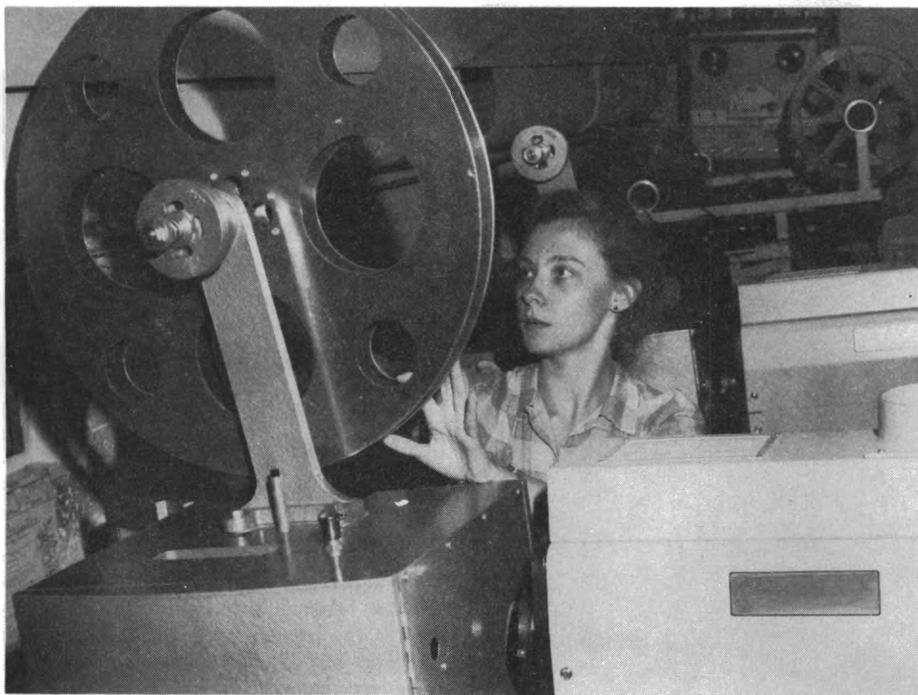
Average hourly earnings for projectionists in large metropolitan areas ranged from \$5 to \$12.50 in 1978, according to information from several union contracts. Wages vary among locals, the specific rate being determined by the type of theater, movie, and equipment involved. Generally, downtown theaters pay higher hourly rates than suburban or drive-in theaters. Projectionists who work more than one screen also receive extra pay.

Related Occupations

Motion picture projectionists operate and repair movie projectors and sound equipment. Others who work with small machinery include appliance repairers, bicycle repairers, blueprinting machine operators, television and radio installers and repairers, and offset-duplicating machine operators.

Sources of Additional Information

Details about training programs and employment opportunities may be obtained from any local of the International Alliance of Theatrical Stage Employees and Moving Picture Machine Operators of the United States and Canada.



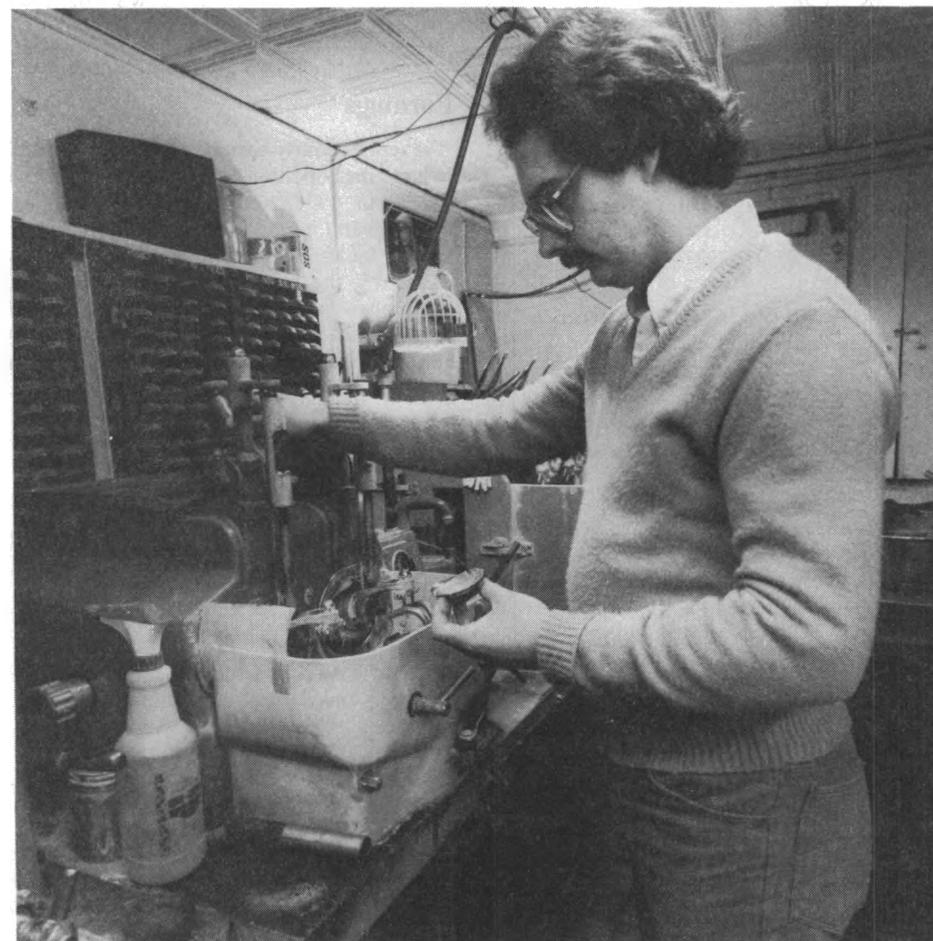
Trainee projectionists first learn simple tasks such as threading and rewinding film.

Ophthalmic Laboratory Technicians

(D.O.T. 716.280-014)

Nature of the Work

Ophthalmic laboratory technicians (also called *optical mechanics*) make eyeglasses according to specifications provided by dispensing opticians, eye physicians (ophthalmologists), and optometrists. Some ophthalmic laboratory technicians help make hard contact lenses. There are two types of ophthalmic laboratory technicians: Surfacers (or lens grinder) and bench technician (or finisher). In small laboratories, one person may perform the tasks of both a surfer 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 lensometers 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.



Ophthalmic laboratory technicians use machines to grind and polish lenses.

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 hand-tools. 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.

Places of Employment

About 26,500 persons worked as ophthalmic laboratory technicians in 1978. Most ophthalmic laboratory technicians work in ophthalmic laboratories. Some work for retail optical dispensaries or other stores that sell prescription lenses. A few work for eye physicians or optometrists who dispense glasses directly to patients.

Ophthalmic laboratory technicians are found in every State. However, employment

is concentrated in large cities and in populous States.

Training, Other Qualifications, and Advancement

The vast majority of all ophthalmic laboratory technicians learn their skills on the job. At first, technician trainees do simple jobs such as processing lenses through a grinding machine. As they gain experience, they progress to other operations such as lens cutting and eyeglass assembly. When the 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.

High school graduates can prepare to become a technician through 3- to 4-year formal apprenticeship programs. Apprentices with exceptional ability may complete their training in a shorter period. Most training authorities agree that technicians who learn as apprentices have more job opportunities and more opportunities for advancement than those without such training.

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 receive training while in the Armed Forces. Others attend community colleges or vocational or technical schools, where they receive certificates, diplomas, or associate degrees in programs varying in length from 9 months to 3 years. Graduates from these types of programs generally need additional on-the-job training.

Employers prefer applicants for entry jobs as ophthalmic laboratory technicians to be high school graduates who have had courses in the basic sciences. A knowledge of physics, algebra, geometry, and mechanical drawing is particularly valuable. Interest in and ability to do precision work are essential.

Some States require licenses for ophthalmic laboratory technicians. To obtain a license, the applicant generally must meet certain minimum standards of education and training and must also pass either a written or practical examination attesting to his or her competency in the field. For specific requirements, the licensing boards of individual States should be consulted.

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.

Employment Outlook

Employment of ophthalmic laboratory technicians is expected to increase about as fast as the average for all occupations through the 1980's. In addition to the job openings from employment growth, some openings will arise from the need to replace experienced workers who retire, die, or leave the occupation for other reasons.

More technicians will be needed due to the rising demand for corrective lenses. This demand is expected to increase as the general population grows and as the elderly, the group requiring the most eye care, continues to grow as a proportion of the general population. State programs to provide eye care for low-income families, union health insurance plans, and Medicare also will stimulate demand. Moreover, the growing variety of frame styles and colors may encourage individuals to buy more than one pair of glasses.

However, because of the small size of the occupation, there will be relatively few job openings. Persons who have completed a formal training program should have the best opportunities for these jobs, while those without formal skills may face competition.

Earnings

Hourly wage rates for ophthalmic technicians ranged from \$5.30 to \$8.75 in 1978, based on information from a small number of union contracts.

Apprentices start at about 60 percent of the skilled worker's rate; their wages are increased periodically so that upon completion of the apprenticeship program, they receive the beginning rate for experienced workers.

Most ophthalmic laboratory technicians work a 5-day, 40-hour week.

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 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, 514 Chestnut St., Big Rapids, Mich. 49307.

National Federation of Opticianry Schools, Ferris State College, Big Rapids, Mich. 49307.

For general information about the occupation, contact:

International Union of Electrical, Radio and Machine Workers, 1126 16th St. NW., Washington, D.C. 20036.

Chairman 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.

Photographic Laboratory Occupations

(D.O.T. 550.485-010, 970.281-018, 976.267-010 through .687-022)

Nature of the Work

Amateur snapshots, home movies, professional portraits, and photographs to illustrate publications require the skills of thousands of photographic laboratory employees. These workers develop film, make prints and slides, and perform related tasks, such as enlarging and retouching photographs. (This chapter does not discuss employees of laboratories who specialize in processing professional motion picture film).

All-round darkroom technicians can perform all tasks 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 solution and are performed in darkness. In a hand operation, the technician first immerses unwound film in the developer, a solution that brings out the image on exposed film. When the film has remained in the developer for a specified period, the technician transfers it 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, in many photographic labs technicians operate machines that automatically perform the steps described above.

Processing of color film is more complex than for black-and-white. 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

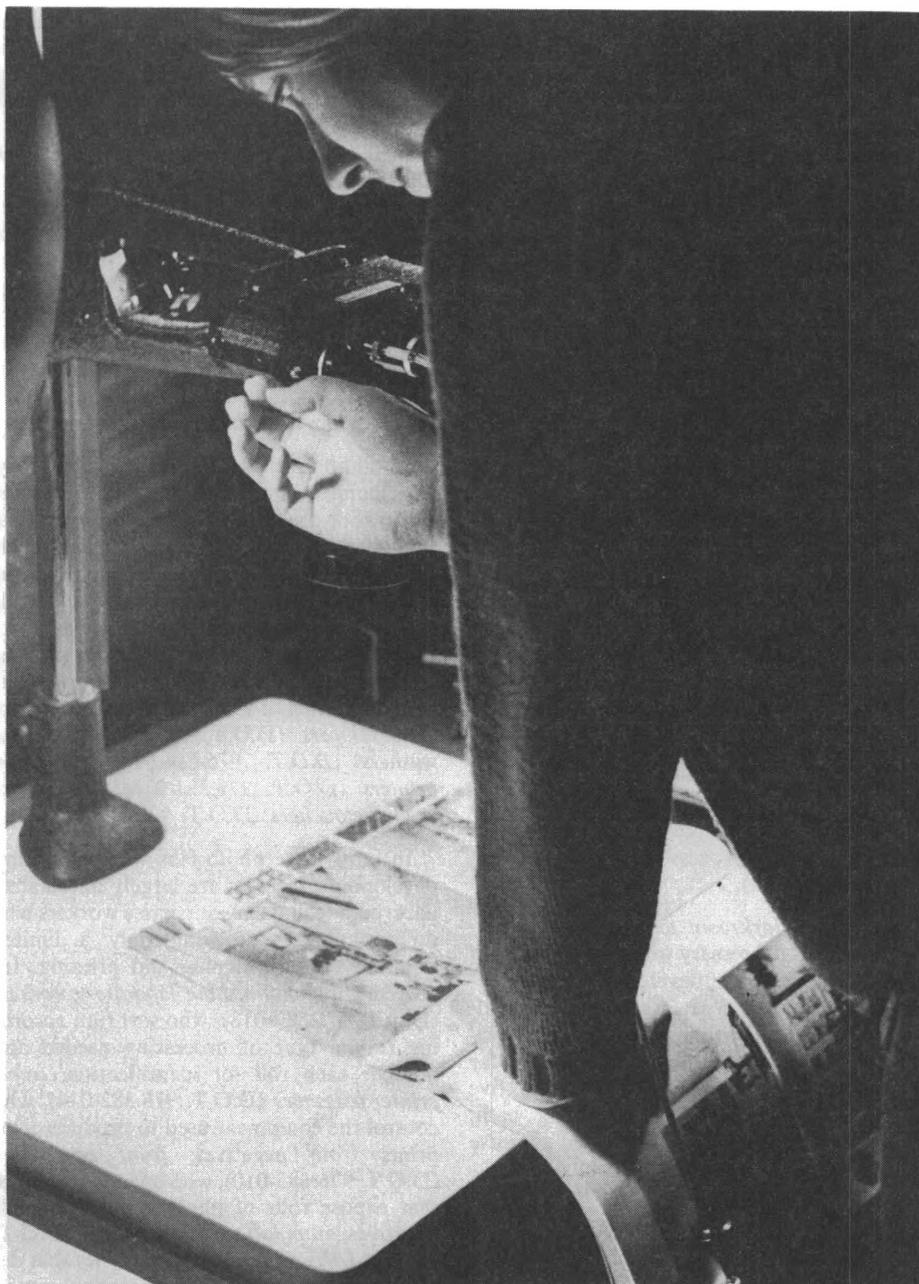
lamp, and a magnifying lens. The technician places the negative between the lamp and lens, and the paper below the lens. When the technician turns on the lamp, light passes through the negative and lens and records a magnified image of the negative on the paper. During printing, the technician may vary 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 the film-developing processes are largely automated, darkroom technicians supervise workers who do assignments requiring 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; *chemical mixers* (D.O.T. 550.485-010), who measure and combine the various chemicals that make up developing solutions; *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.

Working Conditions

Photo lab jobs are not physically strenuous and are performed 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 who perform detailed tasks like photo checkers and assemblers are subject to eye fatigue.



Lab workers reproduce a magazine picture for use as a photo slide.

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 overtime, at premium pay, during peak seasons such as summer and after Christmas.

Places of Employment

In 1978, about 57,000 persons worked in photo lab occupations.

Most workers are employed by 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 lab 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 photographic laboratory 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 become specialists 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.

Two-year curricula leading to an associate degree in photographic technology are offered by several colleges. Formal training also is available from vocational schools and technical institutes. Completion of post-secondary 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 statement on photographers elsewhere in the *Handbook*). Others advance to supervisory positions in laboratories.

On-the-job training for workers in specialized photo lab occupations ranges from a few weeks for film numberers and automatic mounters, for example, to several months for photo checkers and assemblers and chemical mixers. For many jobs, manual dexterity, good vision including normal color perception, and good hand-eye coordination are important qualifications.

Employment Outlook

Employment in photo lab occupations is expected to increase about as fast as the average for all occupations through the 1980's as the demand for film processing rises. In addition to jobs arising from the increase in demand for these workers, many openings will result as workers retire, die, or transfer to other occupations.

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 laboratory workers is not expected to grow as fast as the demand for film processing, however, because of the growing popularity of self-processing instant cameras and the increasing automation of photo lab operations.

Earnings

Earnings of photo lab workers vary greatly depending on skill level, experience, and geographic location. Inexperienced photo lab workers generally earned between

\$2.90 and \$4 an hour in 1978, according to the limited information available. Workers in specialized occupations earned from \$2.90 to \$6 an hour. Among these workers, printer operators and chemical mixers generally had the highest earnings. In general, darkroom technicians and those in supervisory positions earned more than the specialized workers. Most of the experienced darkroom technicians earned between \$5 and \$8 an hour in 1978.

Related Occupations

Some of the more skilled photographic laboratory workers such as all-round darkroom technicians and color-laboratory technicians, require specialized knowledge of the photodeveloping process. Other laboratory workers who apply specialized technical knowledge to perform their jobs include chemical laboratory technicians, criminalists, 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, 603 Lansing Ave., Jackson, Mich. 49202.

Professional Photographers of America, Inc., 1090 Executive Way, Des Plaines, Ill. 60018.

Power Truck Operators

(D.O.T. 921.683-050)

Nature of the Work

In the past, when a company needed products or raw materials moved from one place to another, workers were required to move the items manually. This method, in most cases, was physically demanding and inefficient. Today, the task has been greatly facilitated by the increasing use of power trucks.

A typical power truck has a hydraulic lifting mechanism and forks to carry a load on a wooden skid or pallet, or other attachments for greater versatility. For example, a truck may have a clamp lift to move cartons, bales, or paper rolls, a scoop to lift coal, or a tow bar to pull warehouse trailers.

Because the trucks are steered by the rear wheels and start and stop very quickly, operators must use care and skill in driving. Although power trucks are relatively easy to operate, operators usually must follow special procedures at a plant, warehouse, or construction site. For example, forks must be kept down if the truck is driven without a load. If the load is too high or wide to see around, the operator must drive the truck in reverse. When loading or removing materials

that are stacked on the floor or a platform, drivers must judge distance accurately and operate the truck smoothly so that no damage occurs to the stock. Operators also must know the lifting capacity of the truck and the kinds of jobs it can do.

Operators may have to keep records of materials moved and do some manual loading and unloading. They also may be responsible for keeping their trucks in good working condition by cleaning and oiling them, checking the water in batteries, making simple adjustments, and reporting any mechanical problems.

Working Conditions

Power truck operators are subject to hazards such as collisions and falling objects. Safety laws to minimize these hazards have led to safer, quieter, and better handling trucks. For example, all rider-type power trucks now have overhead guards and most trucks used outdoors have all-weather cabs. Also, more firms are using battery-powered trucks which are relatively noiseless and pollution free.

Places of Employment

About 360,000 persons worked as power truck operators in 1978. About three-fourths of them worked in manufacturing industries. Large numbers were employed in plants that

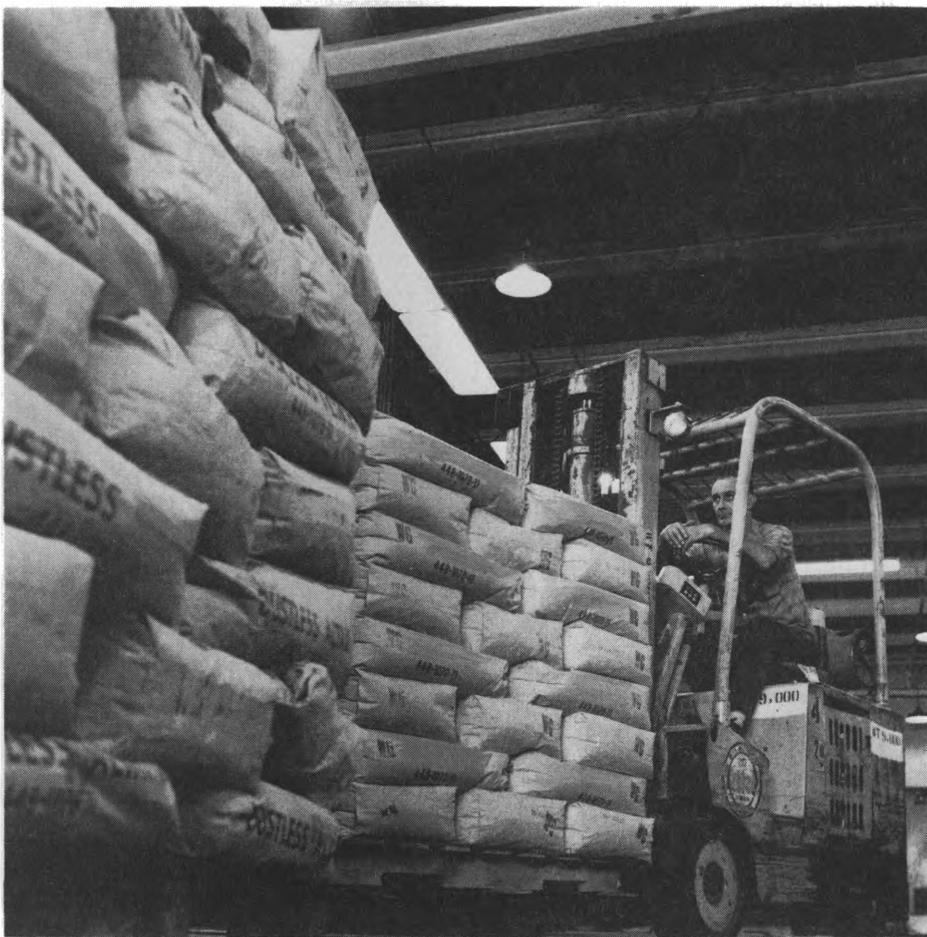
made automobiles, machinery, fabricated metal products, paper, building materials, and iron and steel. Many power trucks operators also were employed in warehouses, depots, freight and marine terminals, and mines.

Power truck operators are employed in all parts of the country, but most work in large industrial and transportation centers.

Training, Other Qualifications, and Advancement

Power truck operators train on the job. Most workers can learn to operate a power truck in a few days. It takes several weeks, however, to learn the layout of the plant, the operation of a truck in the plant, and the handling of materials in the most efficient way.

Many companies have training programs that include classroom instruction and practice with the power truck. In classes, trainees learn how the vehicle and its lift operate, proper methods of transporting materials, simple maintenance procedures, and safe driving rules. These 1- to 5-day programs stress practice with power trucks which trainees may be required to operate on an obstacle course. Because trucks are becoming more versatile and expensive, firms are expected to emphasize training programs which will increase the skills of operators and



Operators must judge distance accurately to avoid damage to merchandise.

avoid damage to trucks and materials from accidents.

Employers seek applicants who have average manual dexterity, strength, and stamina because operators must get on and off the truck frequently and occasionally load and unload material. Good eyesight, including good depth perception, is required to pick up, move, and deposit loads with the power truck. Large companies generally require applicants to pass a physical examination. Some mechanical ability is helpful because operators often perform minor maintenance on power trucks.

Opportunities for advancement are limited. A few operators may become supervisors.

Employment Outlook

Employment of power truck operators is expected to increase about as fast as the average for all occupations through the 1980's. In addition to jobs resulting from employment growth, many operators will be needed to replace those who retire, die, or transfer to other occupations.

As the population grows and living standards rise, and as power trucks increasingly replace hand labor in moving materials, more power truck operators will be needed. The number of jobs available annually will vary, because the occupation is sensitive to changes in the demand for manufactured goods.

Earnings

In 1978, power truck operators earned an average of about \$6.50 an hour, slightly above the average for nonsupervisory workers in private industry, except farming. Earnings of operators varied slightly by region and industry.

Related Occupations

Other occupations using power-operated equipment to lift and move materials include conveyor console operators, crane operators, derrick operators, hoist engineers, jammer operators, and operating engineers.

Sources of Additional Information

Information on work opportunities for power truck operators may be available from the local office of the State employment service.

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 in factories 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 process. They first figure areas to be covered, 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, painters are responsible for other duties on the production line. If an object is to be multicolored, masking tape must be applied to keep colors from overlapping. Production painters who operate

machinery set up the painting equipment at the beginning of the shift and are responsible for keeping it running. Other machines used in the painting process may also be operated by the painters. For example, washing tanks are used 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. Here, production 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 all types of modern painting machinery, such as electrostatic applicators and powder-type painting systems.

Working Conditions

Work schedules of production painters 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



Production painters wear masks to protect them from exposure to fumes.

pressure to keep up with the speed of the lines. Since painters may spray hundreds of identical items a day, the work may become boring.

Because production painters are exposed to fumes from paint and paintmixing ingredients, they may wear masks which cover the nose and mouth. Many wear coveralls to protect their clothes.

Places of Employment

About 133,000 production painters were employed in 1978. More than 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. About one-fourth of all furniture painters were employed in North Carolina and Pennsylvania, while approximately one-third of all automobile painters worked in Michigan—over one-half of these in Detroit. Over one-fourth of the painters employed by companies making machinery and metal products worked in Ohio and Illinois.

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 correspondingly 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 check that paint has been applied evenly.

High school graduation is generally not required for entry level positions, but a diploma or its equivalent may be needed to advance to higher skill levels.

Employment 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 retire, die, or transfer to other occupations.

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, where employment is particularly sensitive to changes in general economic and business conditions. Therefore, employment of these painters can be expected to fluctuate from year to year.

Earnings

Hourly wage rates for production painters ranged from \$3.42 to \$10.50 in 1978, 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, ceramics and pottery makers, and fumigators.

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, 800 E. Jefferson Ave., Detroit, Mich. 48214.

Stationary Engineers

(D.O.T. 950.362, .382, .485-010, .562-010, .585-010, and .685-010)

Nature of the Work

Stationary engineers operate and maintain the machinery that provides mechanical and electrical power for industry, and heat, air-conditioning, refrigeration, and ventilation for factories and other buildings. The equipment they tend and control includes steam boilers, diesel engines, turbines, generators, pumps, condensers, and air compressors.

Stationary engineers start up and shut down equipment, monitor meters and gauges that are attached to equipment to make sure it is running properly, and make adjustments whenever necessary. On a steam boiler, for example, they observe, control, and keep records of steam pressure and 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 or valves or overriding automatic controls.

Stationary engineers also protect equipment from soot and corrosion. Boiler water, for example, frequently is tested for purity and treated with chemicals.

These workers detect and identify any trouble that develops. They watch and listen to machinery and routinely check the safety controls. Often stationary engineers use hand or power tools to make minor repairs, such as replacing defective valves, gaskets, or bearings.

In a large plant, the stationary engineer may be in charge of the boiler room and direct the work of assistant stationary engineers, turbine operators, boiler tenders, and air-conditioning and refrigeration 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, and dirt from the equipment. General maintenance duties may cause contact with oil and grease, and fumes or smoke. Workers also may have to crawl inside boilers and work in crouching or kneeling positions to inspect, clean, or repair equipment.

Because stationary engineers often work around boilers and electrical and mechanical equipment, they must be alert to avoid burns, electric shock, and injury from moving machinery.

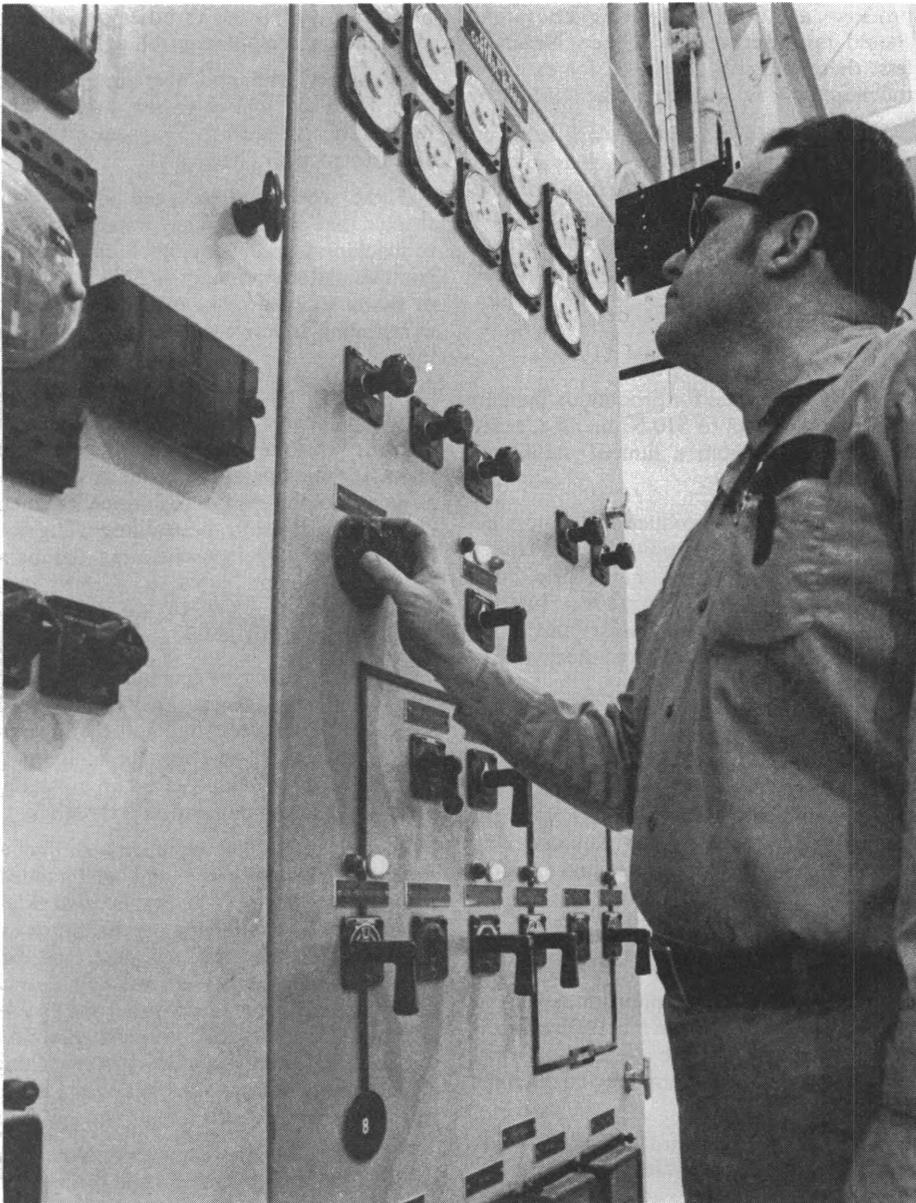
Places of Employment

In 1978, 179,000 stationary engineers were employed in a wide variety of places, including power stations, factories, sewage and water-treatment plants, office and apartment buildings, 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 in-



Stationary engineers monitor meters and gauges to make sure machinery is running properly.

formal 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.

In selecting apprentices, most joint 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 receive classroom instruction in practical chemistry, elementary physics, blueprint reading, applied electricity, and other technical subjects.

Becoming a stationary engineer without going through a formal apprenticeship pro-

gram usually takes many years of experience as an assistant to licensed stationary engineers 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. The chief engineer 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 educa-

tion 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 is now assisting many States in adopting a standardized licensing program that would eliminate 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.

Employment Outlook

Despite an expanding economy which will require more mechanical and electrical power, employment of stationary engineers is expected to show little change through the 1980's. The need for stationary engineers will be limited by the trend toward more powerful and more centralized equipment. For example, a large boiler operated by one stationary engineer can supply heat and refrigeration for several buildings, instead of each building having its own small boiler and its own engineer. Nevertheless, many job openings will arise annually because of the need to replace experienced workers who retire, die, or transfer to other occupations.

Earnings

Stationary engineers had average hourly earnings of \$7.93 in 1978, according to a survey of metropolitan areas. This was almost 50 percent higher than the average for all nonsupervisory workers in private industry, except farming. Averages for engineers in individual cities ranged from \$5.25 in the Greenville-Spartanburg, S.C., metropolitan area to \$9.50 in the Sacramento, Cal., 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 op-

erators, 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.

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, 176 West Adams St., Chicago, Ill. 60603.

Wastewater Treatment Plant Operators (Sewage-Plant Operators)

(D.O.T. 955.362-010)

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 help keep America's water clean by removing harmful domestic and industrial waste.

Waste materials are carried by water through sewer pipes to treatment plants. Operators control equipment to remove these materials or render them harmless. 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 gages to make sure plant equipment is working properly. Other jobs include operating chemical-feeding devices; taking samples of the water and performing chemical and biological laboratory analyses; and testing and adjusting the level of chlorine in the water. Operators also make minor repairs on valves, pumps, and other equipment. They use gages, 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 sewage pipes which might exceed a plant's treatment capacity.

The duties of operators vary depending on the type and size of plant. For example, the treatment process in an industrial plant, such as a food-processing company, may be simple since the wastewater is of a known content. Treatment plants that serve entire cities, on the other hand, must be equipped to treat a mixture of waste products that varies daily, thus making the operator's job more complicated. 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.

As a result of the passage of the Federal Water Pollution Control Act of 1972, water pollution standards will become increasingly stringent. In order to meet these higher 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 un-

pleasant 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. During emergencies, overtime is common. Operators have to stoop, reach, and climb and often get their clothes dirty.

Places of Employment

About 112,000 people worked full time as wastewater treatment plant operators in 1978, of whom about 62,000 worked in municipal plants, 48,000 in private industry, and 2,000 in Federal installations.

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 helpers and learn their skills on the job under the direction of an experienced operator. They learn by doing routine tasks such as recording meter readings; taking samples of wastewater and sludge; and doing simple



Making minor repairs is part of the wastewater treatment plant operator's job.

maintenance and repair work on pumps, electric motors, and valves. They also are expected to perform housekeeping tasks such as cleaning and maintaining plant equipment and property.

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, and, 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 of treatment plant operators. These courses cover principles of sludge digestion, odors and their control, chlorination, sedimentation, biological oxidation, 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. Educational requirements, however, are rising as larger, more complex treatment plants are being 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 limited number of operators may become technicians employed by State water pollution control agencies to monitor and provide technical assistance to plants throughout the State. Some technical-vocational school or junior college training generally is preferred for technician jobs.

In 42 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, with the exception of Alaska.

Under a typical program, there are different classes of certification for different sizes of treatment plants. For example, to be certified a "class I operator" capable of operating a small plant with simple equipment, an applicant should be a high school graduate, demonstrate general knowledge of treatment operations by passing a written test, and complete 1 year of satisfactory employment at a treatment plant. Requirements for certification as a class IV operator who supervises a large plant employing complex technology may require a bachelor's degree in science or engineering; 4 years of treatment plant experience, 2 years of which were in a position of major responsibility; and specific knowledge of the entire field of wastewater treatment as demonstrated through a written test. Typically, a large plant would employ mostly operators certified for operating small or medium-sized plants, but always under the supervision of a class IV operator.

Employment Outlook

Employment of wastewater treatment plant operators is expected to increase much faster than the average for all occupations through the 1980's, mainly as a result of the construction of new treatment plants to process the increasing amount of domestic and industrial wastewater. Also, more highly trained operators will be needed as existing plants expand and modernize their facilities to cope more effectively with water pollution. In addition to new jobs from expansion of wastewater treatment, many job openings will occur as experienced operators retire, die, or transfer to other occupations. Those operators with formal training will have the best job opportunities.

People who enter this field should have steady employment in the years ahead. Even during economic downturns, treatment plants seldom lay off employees.

Earnings

According to a survey conducted by the Water Pollution Control Federation, average annual salaries of wastewater treatment plant operators ranged from \$9,300 to \$14,100 in 1978. Some experienced operators earned as much as \$22,000 a year. Salaries depend, among other things, on the size of the plant and the complexity of the operator's job. Salaries for trainees were roughly 90 percent of operators' salaries. Average yearly salaries of supervisors of wastewater treatment plants ranged from \$10,200 to \$21,300, while those of superintendents ranged from \$12,200 to \$24,600. Average earnings of experienced wastewater treatment plant operators are above the average for all nonsupervisory workers in private industry, except farming.

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

People interested in a career in wastewater treatment should contact their local or State water pollution control agencies. Additional information is available from:

Water Pollution Control Federation, 2626 Pennsylvania Ave. NW., Washington, D.C. 20037.

Manpower Planning and Training Branch (WH-596), Office of Water Program Operations, Environmental Protection Agency, Washington, D.C. 20460.

Welders

(D.O.T. 81)

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. It also joins 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 in the arc as electric current flows through the 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 give the joint 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 so that they 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. Other jobs can be handled by unskilled welding machine operators who simply press a button to start the welding machine. 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, 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 used in some places. 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 such 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 over 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 electrodes.

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, they examine the pipe and prepare the break for repair. Maintenance welders 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 have the skills required of shipbuilding or maintenance welders. For example, less skilled workers use semiautomatic arc weld equipment to weld automobile frames. Semiautomatic equipment automatically supplies the proper amount of arc heat and filler material to the joint. For example, 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 re-

quires less manipulative skill because all parts are identical and each is welded in the same position.

Large factories, having many identical parts to be welded may reduce production costs by using automatic arc, electron beam, or resistance welding machines. 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. 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 rather than join metal. Some electrically and mechanically operated machines follow guidelines automatically.

Working Conditions

Welders are exposed to more potential hazards than most other workers. 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.

Places of Employment

In 1978, about 679,000 welders and flame cutters were employed, including a relatively small number of cutters who used both flame and arc-cutting equipment. Almost two-thirds of all welders help manufacture durable goods; for example, boilers, bulldozers, trucks, ships, and heavy machinery. Most of the rest repair metal products or help construct bridges, large buildings, and pipelines.

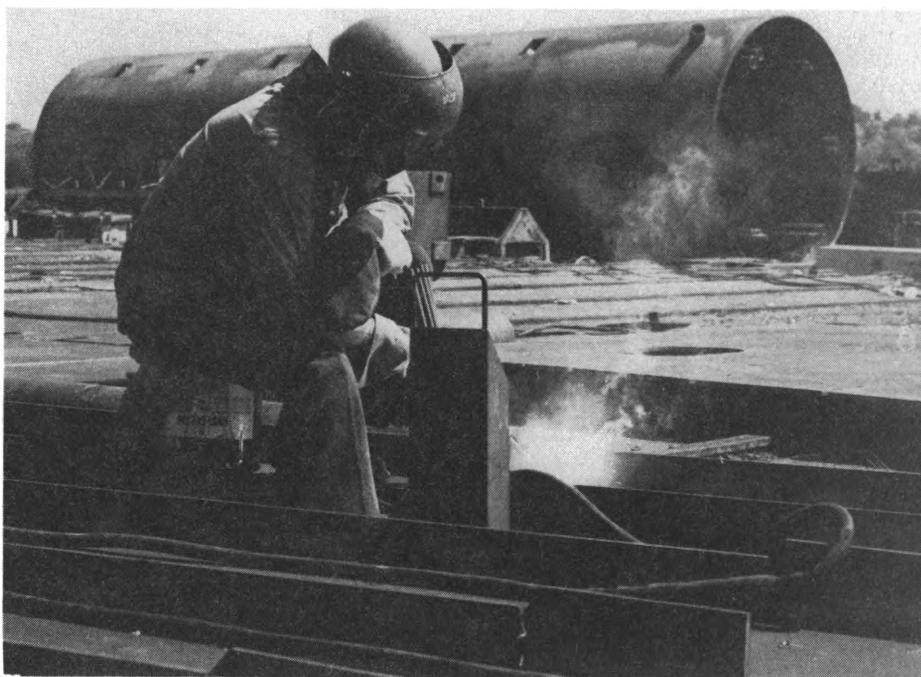
Welders are concentrated in the manufacturing centers of the Great Lakes States. About one-third work in Pennsylvania, Ohio, Michigan, Indiana, and Illinois. The rest are distributed much the same as the population, with large numbers in New York, Texas, Wisconsin, and California.

Training, Other Qualifications, and Advancement

Though several years of on-the-job training are required to become a skilled welder, less skilled work can be learned on the job in a few months. Some welding operators, for example, can operate a machine in a few hours and handle all parts of their job in a week.

Beginners often start in simple production jobs where the type and thickness of the metal and the position of the welding operation rarely change. As the need arises, supervisors or experienced workers teach new employees how to weld vertical and overhead joints and different metals. Many large companies train their own welders. A few companies have apprenticeship programs including classroom and on-the-job training that last several years.

Persons planning careers as welders or cutters need manual dexterity, good eyesight, and good eye-hand coordination. They



Skilled welders know the characteristics of many metals.

should have the ability to concentrate on detailed work for long periods, and be physical 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, require new skills. Because of the hazards of nuclear power plant operation or high-speed air and space travel, both industries demand 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.

Employment Outlook

Employment for welders is expected to increase faster than the average for all occupations through the 1980's because of the greater use of welding. In addition, many jobs should arise each year as welders retire, die, or transfer to other occupations. Job opportunities may vary as the economy fluctuates.

Increases in population and income are expected to stimulate demand for cars, buildings, heavy machinery, appliances, and thousands of other products that welders help make. Employment of welders also is expected to increase as welding replaces other methods of joining metals. Welding generally is cheaper than other methods of joining metal parts, and it is being used more frequently in the manufacturing and construction industries.

Earnings

National wage data on welders are not available. However, the limited data available indicate that welding machine operators earned from \$6 to \$7 an hour in 1978. Welders in the construction industry earned \$9 to \$12 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 Boilermak-

ers, 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 (Ind.).

Related Occupations

Welders are highly skilled workers who must be very familiar with the properties of metal and 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, instrument makers (mechanical), machine tool operators, and tool-and-die makers.

Sources of Additional Information

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.

OFFICE OCCUPATIONS

Office workers perform a wide range of tasks that are needed to keep business and other organizations running on a day-to-day basis. Clerical workers, such as secretaries and typists, keep records and maintain files, type, and operate office machines. Professional and technical employees give legal advice, prepare and analyze financial reports, design computer systems, and arrange bank loans.

Opportunities in office work exist for people with many different educational backgrounds. Some jobs can be entered with a high school education; many others, however, require at least a college degree.

Office work also involves a wide variety of skills. Most professionals, for example, need problem-solving ability to analyze data and help determine company policy. Clerical workers must pay close attention to detail in

order to maintain accurate records. Besides the technical skills required to do their jobs, all office workers need good judgment and the ability to communicate their ideas to others.

This chapter of the *Handbook* describes office work in clerical occupations, computer and related occupations, banking occupations, insurance occupations, and administrative and related occupations.

Clerical Occupations

About 17 million people worked in clerical jobs in 1978. Many kept records and did other office paperwork. Others handled communications, operated office machines, shipped and received merchandise, and rang sales on cash registers.

Workers in clerical jobs have a wide variety of skills and experience. They include highly skilled title searchers in real estate firms and executive secretaries in business offices as well as relatively unskilled messengers and file clerks. Despite the diversity of jobs and duties, clerical employment is concentrated in a few familiar jobs. Roughly 1 of every 5 clerical workers is a secretary. One in ten is a bookkeeper. The accompanying chart shows employment in these and other major clerical occupations discussed in this section of the *Handbook*. Other sections of the *Handbook* also discuss clerical occupations. See the statements on computer operating personnel, bank clerks, bank tellers, mail carriers, telephone operators, teacher aides, and social service aides.

Training, Other Qualifications, and Advancement

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 and accurate paperwork is required for nearly all entry level positions, and some employers expect applicants to take typing or clerical aptitude tests. 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. Many work-study programs permit students to earn school credits while they gain experience in a clerical job. Many States and localities sponsor programs to train unemployed and low-skilled workers for entry level jobs.

Whether or not they have had formal training in business and office practices, beginning clerical workers generally receive some on-the-job training. They learn how their employers keep records and become familiar with the kinds of business forms used. Some workers learn to operate adding and duplicating machines; others may attend classes to learn how to operate word processing equipment; still others learn about the procedures involved in handling stock or inventory control.

Continuing changes in the office environment, many made possible by the computer, have increased the demand for clerical workers who are adaptable, flexible, and versatile. Workers must be prepared to be retrained whenever an employer introduces new equipment. Secretaries and typists, for example, 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 up-

dated makes retraining or continuing education more important than ever for clerical workers.

Advancement opportunities for clerical workers are good, and many employers provide courses in the 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 or typists. Promotion to such jobs as administrative assistant, office manager, or clerical supervisor generally depends on leadership ability, work experience, and knowledge of the organization as a whole.

Employment Outlook

Employment of clerical workers is expected to increase faster than the average for all occupations through the 1980's. In addition to new jobs, many openings will occur as employees die, retire, or leave their jobs.

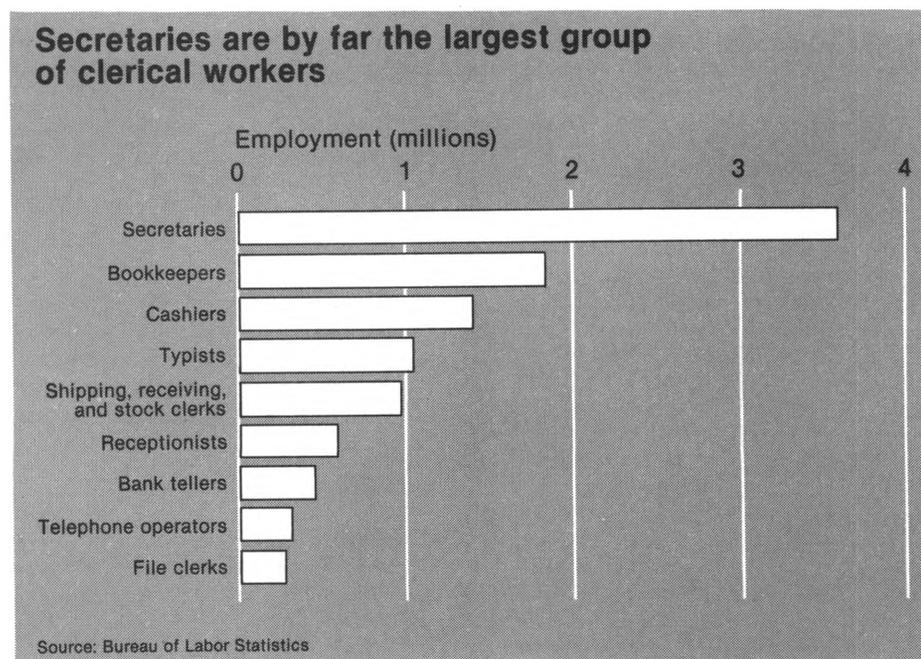
Growth in the number of clerical workers is expected to result primarily from an increase in paperwork in most kinds of organizations. Although a great deal of paperwork is handled by computer, and automation has had a strong impact on office equipment and procedures, computerization and automation will not affect all clerical jobs. Job opportunities will be especially favorable for receptionists, secretaries, and typists. Demand for these workers will continue to be strong in banking, insurance, and manufacturing and in firms that provide business, professional, health, or educational services. Opportunities may be reduced in a number of routine clerical jobs such as payroll, bank, and file clerk.

At the same time, the nature of clerical jobs is likely to change. The introduction of new equipment often involves a reorganization of work flow, office procedures, and staff. Very often, this entails retraining staff, assigning new responsibilities, and doing the job somewhat differently.

Persons with clerical skills, particularly secretarial and typing, should find extensive opportunities for temporary or part-time work as more employers use these workers during peak business periods.

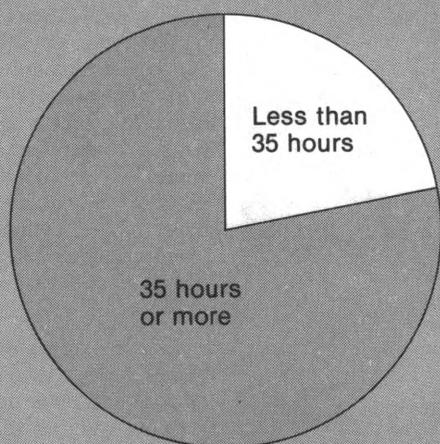
Earnings

Some clerks in routine jobs earned just over \$100 a week, while highly skilled workers were paid \$200 or more, according to a 1978 survey. Salary variations within an occupation are relatively com-



Clerical occupations are a major source of part-time work—more than 1 out of every 5 works less than 35 hours a week

Hours employed per week, 1978



Source: Bureau of Labor Statistics

mon and usually reflect differences in educational level, work experience, and level of responsibility.

Salaries in different parts of the country also vary; earnings generally are lowest in southern cities and highest in northeastern and western urban areas. In 1978, for example, secretaries averaged \$225 a week in the Northeast, \$236 in the West, and \$210 in southern cities.

Clerical employees work 40 hours a week in many cities. In some, especially in the Northeast, the scheduled workweek is 37 hours or less.

Most clerical workers in large cities receive 7 paid holidays or more a year and a 2 week vacation after working 1 year. Longer vacations, based on added years of service, may range to 4 weeks or more. Group life and health insurance plans, sickness benefits, and retirement plans often are available.

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 from:

Association of Independent Colleges and Schools, 1730 M St. NW., Washington, D.C. 20036.

For the names of labor organizations and professional associations that can provide information about specific occupations, see the discussions of individual clerical occupations that follow.

Bookkeeping Workers

(D.O.T. 210.382-010 through -026)

Nature of the Work

Every business needs systematic and up-to-date records of accounts and business transactions. Bookkeeping workers maintain these records in journals, 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 machines, mechanical or electronic bookkeeping machines, and other kinds of office equipment.

In many small firms, a *general bookkeeper* (D.O.T. 210.382-014) 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 that 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 the telephone.

In large businesses, several bookkeepers and accounting clerks work under the direction of a head or supervisory bookkeeper. In these organizations, bookkeepers often specialize in certain types of work. Some, for example, prepare statements of a company's income from sales or its daily operating expenses. Others may post payments and charges on cards using bookkeeping machines, or feed information on accounts receivable and accounts payable into the computer. *Accounting clerks* (D.O.T. 216.-482-010), sometimes known as bookkeeping clerks, perform a variety of routine tasks.

They record business transactions, including payroll deductions and bills paid and due. They also may type vouchers, invoices, and other financial records.

Working Conditions

For the most part, working conditions for bookkeeping workers 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.

Places of Employment

More than 1.8 million persons worked as bookkeeping workers in 1978. Jobs for bookkeeping workers are found throughout the economy—in business firms mostly, but also in schools, hospitals, nonprofit organizations, and government agencies. An especially large number of bookkeepers work in wholesale and retail trade. Approximately 1 bookkeeper in 3 works for a retail store or wholesaler.

Training, Other Qualifications, and Advancement

High school graduates who have taken business arithmetic, bookkeeping, and principles of accounting meet the requirements for most bookkeeping jobs. Some employers prefer applicants who have completed business courses at a community or junior college or business school. Employers sometimes seek applicants who have had experience working with accounts payable and receivable. A familiarity with bookkeeping machines and the ways in which computers are used in bookkeeping operations is an asset. A knowledge of typing also is useful.

Training for this occupation is widely available. Bookkeeping is taught in high schools, in community and junior colleges, and in business schools and colleges. Business education programs typically include bookkeeping-accounting, business law, business arithmetic, office practices, and principles of data processing 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, bookkeeping workers must be licensed to work on tax returns. State licensing agencies can provide information on these requirements in your area.

Above all, bookkeeping workers need to be good at working with numbers. They also have to be able to concentrate 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



Bookkeeping workers must perform calculations quickly and accurately.

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. They advance to more responsible assignments, such as preparing income statements and operating bookkeeping machines or computers.

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 substituted for such courses.

Employment Outlook

Jobs for bookkeepers will be numerous through the 1980's even though employment in the occupation is expected to grow slowly. The occupation is large and turnover is high. Many openings will occur, therefore, because of the need to replace workers who die, retire, or leave the occupation for other reasons.

Future employment growth in this occupation will be slowed by the increasing use of bookkeeping machines and computers that process data more accurately, rapidly, and economically than workers doing it by hand.

Earnings

Beginning accounting clerks in private firms averaged \$724 a month in 1978, according to a Bureau of Labor Statistics survey of clerical occupations. They had higher salaries, on the average, than beginning file clerks or typists, but earned less than beginning secretaries or stenographers. Experienced accounting clerks earned \$916 a month, about the same as the average for all

nonsupervisory workers in private industry, except farming.

In early 1979, the starting salary in the Federal Government was \$7,422 for bookkeeping workers right out of high school. Applicants for Federal jobs who had 1 year of experience or 1 year of education beyond high school could start at \$8,366. The average salary for general accounting clerks in the Federal Government in 1978 was \$14,802 per year.

Related Occupations

Workers in a number of other jobs compute totals and record financial transactions. Like bookkeepers, they must be good at working with numbers. Among such workers are audit clerks, payroll clerks, posting clerks, statistical clerks, and bank tellers.

Sources of Additional Information

See the statement on clerical occupations for sources of additional information.

Cashiers

(D.O.T. 211.137., .362-010, .367-010, .462, .467, .482, and .582, 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 employers, may do other

jobs and have different job titles. Those who work 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 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.

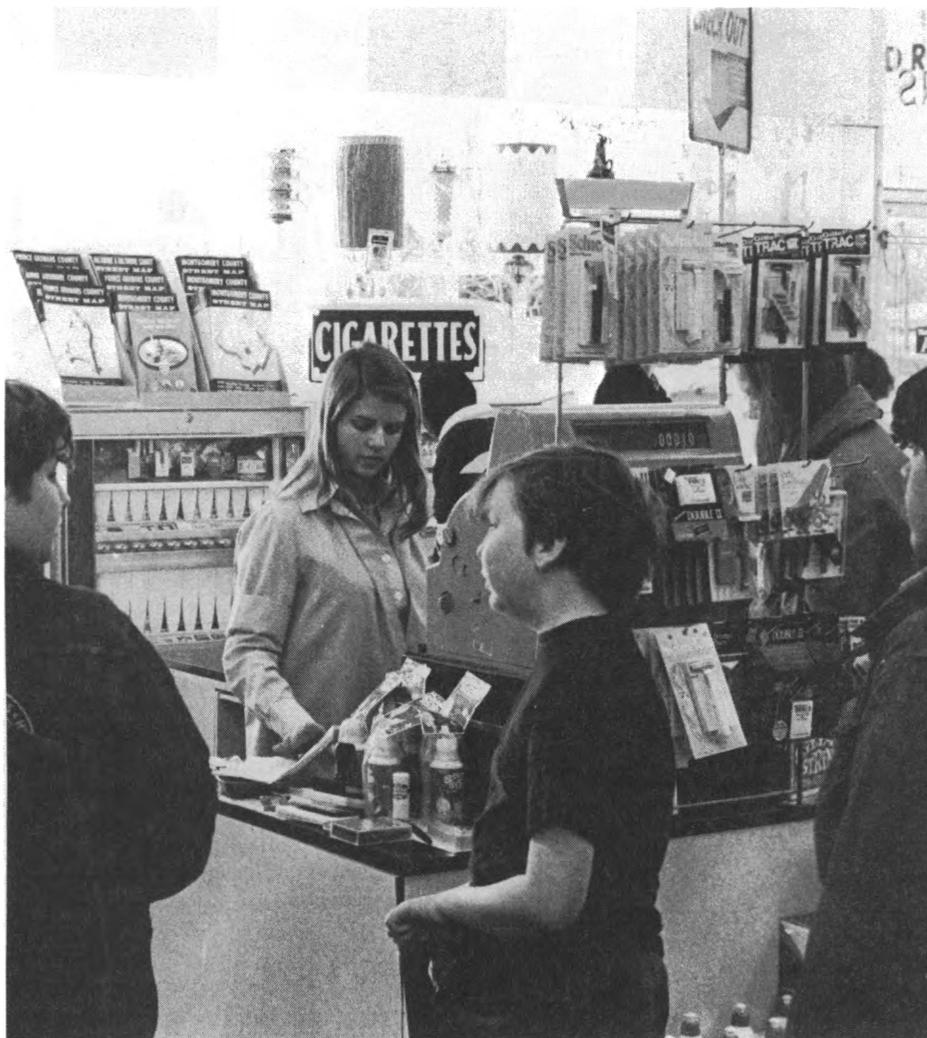
Places of Employment

In 1978, about 1,400,000 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 in other kinds of retail stores. Restaurants, theaters, schools, and hospitals also employ a large number of cashiers. Businesses employing cashiers are located in large cities, in suburban shopping centers, in small towns, and in 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. Courses in business



Because they meet the public, cashiers should be neat in appearance, tactful, and pleasant.

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 also are filled by promoting other qualified workers who are 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 as 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 clerical job, such as bookkeeper, or to a managerial position. Cashiers working in chainstores and other large retail businesses, for example, may advance to department or store managers.

Employment Outlook

Job openings for cashiers are expected to be plentiful through the 1980's. Employment is expected to grow faster than the average for all occupations. Some new jobs will result from growth in retail trade. However, much more important as a source of jobs for cashiers will be the need to replace workers who die, retire, or change jobs. Because the occupation is large and turnover is high, many cashier jobs will be available over the next 10 years.

Further 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 programed 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 slow the adoption of such systems.

Earnings

Beginning cashiers often earn the minimum wage required by law. In establishments covered by the Federal law, the minimum was \$2.65 an hour in 1978. In addition, minimum wages in many establishments are governed by State law. Cashiers earn wages ranging from the minimum in a given establishment to several times that amount. According to a 1977 Bureau of Labor Statistics survey of grocery stores, the top hourly union rates for full-time cashiers ranged from \$3.72 to \$7.64. 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 \$6.67 per hour in 1978; beginners earned average wages of \$4.50 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 other benefits available to other workers.

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 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, and sales clerks.

Sources of Additional Information

Details about employment opportunities are available from local businesses and the local office of the State employment service.

Collection Workers

(D.O.T. 241.367-010)

Nature of the Work

Companies that lend money or extend credit expect to be repaid. However, customers who "buy now" are not always able to "pay later." Collection workers, often called bill collectors, help maintain a company's financial well-being by keeping bad debts to a minimum.

A collector's primary job is to convince 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.

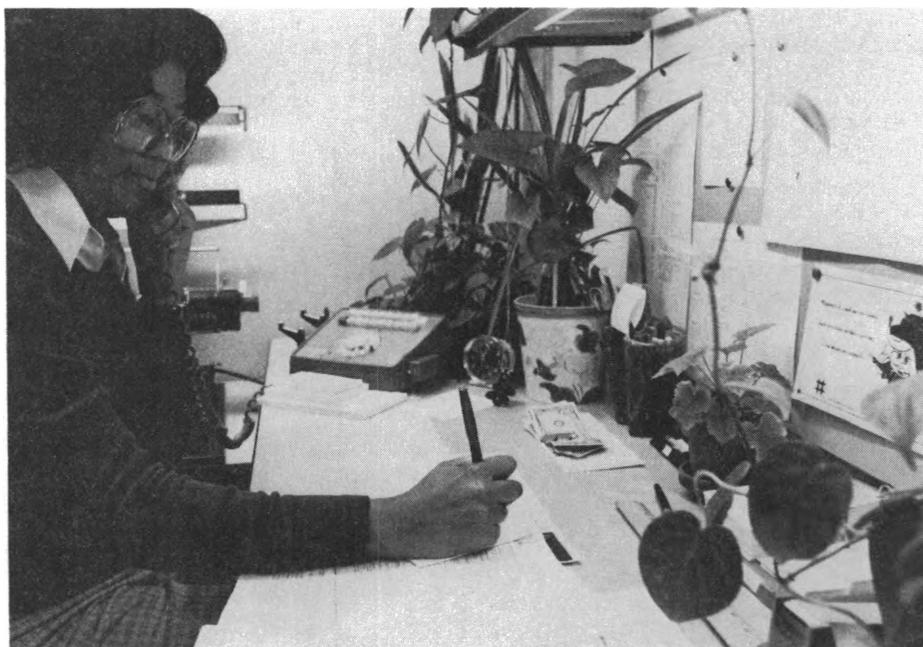
The collector then contacts the debtor by phone or by mail, determines why the bill is unpaid, and tries to get the debtor to pay or make new arrangements for payment.

The approach that collectors use depends on the type of payment problem they are handling. For example, customers may feel that the bill is incorrect, or that the merchandise they bought is faulty, or that services they were billed for were not properly performed. Collectors normally recommend that the debtors resolve these disagreements by contacting the original sellers. In large stores, problems are referred to special "customer service" departments, set up to deal with disputed accounts. 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 met with financial emergencies or 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 "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 collectors supervise the repossession procedure for businesses that reclaim goods when payment is not made, such as banks and finance companies.



Collection workers must be quick witted and persuasive to get people to pay their debts.

Working Conditions

Collectors spend most of their time in the office. In most cases, the person with the delinquent account has received a form letter reminder that the account is past due, and the collector's job is to follow up by making telephone calls. On rare occasions, a collector may make a personal visit to the debtor. These visits usually are necessary when a large amount of money is involved and the debtor has not responded to telephone contact.

Places of Employment

About 78,000 collection workers were employed in 1978. Although collectors work for a variety of businesses, most are employed by banks, loan companies, and collection agencies. Many others work for retail and wholesale businesses.

Jobs for collectors are located throughout the United States, but opportunities are best in heavily populated urban centers. Many firms with branch offices in rural areas locate their collection departments in the business district of 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. Previous employment as a sales clerk can help the collection workers learn how credit transactions originate and how they are handled at the point of sales. Knowledge of a foreign language may be an asset for persons seeking collection jobs in areas with a large non-English-speaking population.

Usually, the collector's training is on the job. The employer may provide training manuals that explain collection procedures, but more often the new employee gains collection skills informally. For example, the new collector learns telephone techniques by observing experienced workers make collection calls.

Training also is available through the educational branch of the American Collectors' Association, which offers short courses for collectors in areas such as collection of bad debts by telephone and skip tracing.

A collector's most important asset is the ability to get along with different kinds of people. He or she must be alert, imaginative, and quick-witted to handle the difficult situations that are part of collection work. While collectors should be sympathetic to the bill-payers' problems, they also must be persuasive 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.

The collector's job generally offers limited opportunities for advancement; competition for the few supervisory positions is keen. The collector with above-average abilities, however, may become a collection manager or supervisor of a staff of collectors. A few collection workers progress to other positions in the credit field, such as bank loan officer or supervisor in a collection agency. Further education, such as that available through professional associations of collectors or college courses, may be helpful for advanced positions in the credit and collection field.

Employment Outlook

The applicant who has a background of high school business courses and can demon-

strate effective telephone skills should find good job opportunities in the collection field. Demand is strongest for people who are personable, outgoing, and have the ability to motivate others, for traits such as these are likely to lead to success on the job.

In recent years, the role of the collector has expanded to include customer debt counseling, and collection methods have been modified in line with modern management techniques and recent consumer legislation. Despite this improved image, the number of persons seeking collection jobs is expected to fall short of the need for additional workers. Employers will need large numbers of collectors to fill vacancies created by turnover, which is relatively high in this occupation. In addition, new positions will open up as the need for collection work grows.

Employment opportunities should be best in collection agencies, where replacement needs continue to be high, and in retail trade firms, where earnings often are somewhat lower than the average. 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 suburban retail stores. Delinquent accounts, unfortunately, are an unavoidable aspect of the credit system. As businesses extend attractive credit terms for the purchase of greater numbers of goods and services to more and more people, the number of delinquent accounts can be expected to increase. Additional collection workers will be required to service these accounts on a person-to-person basis.

Earnings

Although earnings for collectors vary among employers, the limited information available indicates that beginning collectors earned about \$165 a week in 1978, or about \$8,600 a year. Managers of collection departments often earned \$17,000 a year and more.

A survey by the American Collectors Association showed that telephone collectors working for collection agencies had an average monthly income of \$950, or about \$11,400 a year. Incomes of individual workers can vary substantially because collection agencies generally use some form of salary plus commission plan as an incentive to their collectors.

Commission schedules vary widely from agency to agency. A collector may be paid a relatively high salary with a low rate of commission or receive a low salary and a high rate on the money he or she collects for the agency. In some agencies, a quota is assigned to a collector or group of collectors and a bonus is paid if the quota is reached. A few collection workers only earn commissions.

In addition to salary, collectors receive the benefits common to other office occupations,

such as paid vacations and health insurance. Those who occasionally make visits outside the office usually are furnished a company car or are paid expenses for using their own automobile.

Related Occupations

Many other workers deal with customers to adjust claims, arrange for payment of debts, and repossess merchandise. Some of these workers are customer-complaint clerks, credit analysts, credit reporters, collection clerks, repossessors, and skip tracers.

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.

File Clerks

(D.O.T. 206)

Nature of the Work

An orderly file system is often the key to an efficient organization. In most offices, records are arranged so that information can be located quickly. This creates many job opportunities for file clerks, who keep records accurate, up to date, and properly placed.

File clerks classify, store, update, and retrieve office information on request. To do this, they examine incoming material and store it for future use according to a system, such as by number, letter of the alphabet, or subject matter. When these records are requested, file clerks locate them and turn them over to the borrower. They keep track of materials removed from the files and make sure that those given out are returned.

Some clerks operate mechanized files that rotate to bring the needed records to them. Others retrieve documents or spools of microfilm and place them in an electronic transmitter that displays the information on video terminals located elsewhere in the organization. Records must be up to date to be useful. File clerks make sure that new information is added to existing files shortly after it is received.

From time to time, file clerks may destroy outdated file materials or transfer them to inactive storage. They check files at regular intervals to ensure that all items are correctly placed. Whenever data cannot be located, the file clerk searches for the missing records. As an organization's needs for information change, file clerks modify old filing systems or establish new ones.

In small offices, file clerks often type, sort mail, or operate duplicating machines. Those who work with automated filing systems may code and microfilm all incoming documents.

Working Conditions

File clerks usually work in offices, with a company's other clerical workers. However, if the organization has a central filing room, workers may be separated from other departments. Although they do not do heavy lifting, file clerks must frequently stoop, bend, and reach.

Places of Employment

About 273,000 persons worked as file clerks in 1978. In addition, many other clerical workers performed some filing tasks in connection with their work. As in other clerical occupations, opportunities for temporary or part-time work are abundant. Although filing jobs are found in almost every kind of organization, about one-half of all file clerks work in banking, insurance, or real estate firms, or in the offices of lawyers, doctors, and other professionals.

Training, Other Qualifications, and Advancement

Employers prefer high school graduates for beginning file clerk positions. Generally, they seek applicants who can type and do accurate paperwork. Many employers prefer applicants who have some knowledge of office practices as well.

High schools, community and junior colleges, and business schools teach these and other skills. Business education programs typically include courses in typing, shorthand, clerk-typist skills, and office practices and procedures. Many programs have work-study arrangements which permit students to earn school credits while they gain experience in an office job. Many States and localities sponsor programs to train unemployed and low-skilled workers who can read and spell well for beginning clerical jobs as file clerks.

Because file clerk generally is an entry level job, some employers consider an applicant's willingness to work and learn more important than any special training or education. The file clerk usually receives some training when beginning work. On-the-job training almost always is necessary because each organization has its own filing system and office procedures. In organizations that have their own filing procedures, the clerk learns the job in a few weeks. Learning to operate mechanical filing systems usually takes more time. If more than filing is involved, several months of on-the-job training is needed.

File clerks must read accurately and rapidly, spell well, and like detailed work. Most file clerks must be able to type. They should be neat, able to work as part of a team, and not be easily bored by repetitive tasks.

File clerk jobs often are filled by beginners. Workers can advance to more difficult filing duties and to jobs supervising other file clerks. In addition, after some experience and more training, they may be promoted to jobs



File clerks add new records to existing files shortly after they are received.

as typists, receptionists, or office machine operators.

Employment Outlook

Employment of file clerks is expected to grow about as fast as the average for all occupations through the 1980's as business expansion continues to create a need for more and better recordkeeping. In addition, a large number of file clerks will be needed each year to replace those who die, retire, or transfer to other jobs.

The growing volume of paperwork and continued expansion of those businesses that traditionally have employed many file clerks is expected to assure steady employment growth. However, this growth will be slower than in past years, reflecting more extensive use of computers to arrange, store, and transmit information. Jobseekers who have typing and other secretarial skills and are familiar with a wide range of office machines should have better opportunities than less experienced applicants. File clerks should find many opportunities for temporary or part-time work, especially during peak business periods.

Earnings

According to a recent survey, beginning file clerks in urban areas averaged \$127 a week in 1978. Those with some experience averaged \$152; those with a great deal of experience, \$194. File clerks earned somewhat less than three-fourths of the average earnings of nonsupervisory workers in private industry, except farming.

In the Federal Government, beginning file clerks without high school diplomas started at about \$126 a week in early 1979, and high school graduates began at \$143 a week. Experienced file clerks in the Fed-

eral Government averaged about \$187 a week in 1978.

Related Occupations

Other workers sort, store, and retrieve documents and other materials. Among these are general clerks, mail handlers, property clerks, tape librarians, collators, and sorters.

Sources of Additional Information

See the statement on clerical occupations for sources of additional information.

Hotel Front Office Clerks

(D.O.T. 238.137-010, .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 79,000 persons worked as front office clerks in 1978.

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.

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.

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 & Motel Association. (See the chapter on hotel managers and assistants elsewhere in the *Handbook*.) 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.

Employment Outlook

Employment of front office clerks is expected to grow about as fast as the average for all occupations through the 1980's. Employment growth will be limited by the use of computerized front office systems in most hotel and motel chains, and most job openings will result from the need to replace



Computerization of reservation systems will increase the training requirements for many front office clerks.

workers who die, retire, or leave the occupation.

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/hostesses, and sales clerks.

See the statement on the hotel industry elsewhere in the *Handbook* for information on earnings and working conditions, sources of additional information, and more information on employment outlook.

Office Machine Operators

(D.O.T. 207; 208.462-010 and .582-014; 210.382-022 and -026; 213.682-010; 214.482-010; and 216.482-014 and -022)

Nature of the Work

To speed their paperwork, most businesses use office machines to record information, determine bills and inventories, and perform other operations. Some of the clerical workers who operate copiers, bookkeeping machines, calculators, and the many other kinds of machines commonly found in offices are described in this statement. (Several other jobs that involve the use of office machines are described elsewhere in the *Handbook*. See the statements on computer operating personnel, bank clerks, statistical clerks, typists, and secretaries and stenographers.)

Billing machine operators (D.O.T. 214-482-010) prepare customer statements by typing information, such as customers' names, purchases, and amount of sales, on a billing machine that automatically computes the balances and required payments.

Bookkeeping machine operators (D.O.T. 210.382-022 and -026) record a firm's financial transactions on a bookkeeping machine and calculate trial balances, summary reports, and other necessary data.

Adding and calculating machine operators (D.O.T. 216.482-014 and -022) use mechanical adding machines and electronic calculators to compute payrolls and invoices and do other statistical work.

Mail preparing and mail handling machine operators (D.O.T. 208.462-010) use machines to open incoming mail and prepare bills and letters for mailing. Some machines fold and insert enclosures, while others address, seal, and stamp envelopes. Addressing machines print addresses on envelopes using stencils or metal plates prepared by *embossing machine operators* (D.O.T. 208.582-014) using special typewriters.

Duplicating machine operators (D.O.T. 207) run equipment that can reproduce letters, bills, invoices, and other documents. Included are mimeograph, stencil, and copying machines. These workers keep the machines loaded with paper, see that they are properly adjusted for the number of copies to be made, and may collate—put together—pages of lengthy documents by hand or machine.

Tabulating machine operators (D.O.T. 213.682-010) operate machines that sort and total large quantities of accounting and statistical information and print the results on special business forms.

Working Conditions

Because some types of office machines are very noisy, operators may work in special areas apart from other company offices. In other respects, working conditions are similar to those of other office workers in the same firm. The work requires sitting for long periods and demands concentration and attention to detail, which may tire some people.

Places of Employment

In 1978, about 160,000 people worked as office machine operators. Large numbers were employed by banks, insurance companies, and wholesale and retail stores. Many office machine operators work for firms that specialize in providing such business services as preparing bills, mailing circulars, and copying and collating records and reports.

Training, Other Qualifications, and Advancement

Employers prefer high school or business school graduates for all but the most routine office machine jobs. Most newly hired workers are expected to be able to type, operate adding machines and calculators, and use basic business arithmetic. These skills, which are taught in nearly all high schools, are useful for most office jobs. Vocational education programs offered by most public school systems provide training in office machine operation. In addition, private business schools often teach machine operation as part of the training for clerical jobs.

Previous training may not be necessary, however, for this is a beginning clerical job and most employers expect to train newly hired workers. The amount of instruction and on-the-job training beginners receive depends on the types of machines they operate. Duplicating machine operators, for example, work with simplified and automated equipment; they generally learn their jobs in a few days. Bookkeeping machine operators, however, use more complex equipment and may need several weeks to learn to use their machines correctly.

Sometimes training is given at schools run by office equipment manufacturers. Advances in office technology mean fairly frequent changes in office machinery and equipment. When new machines are installed, all the operators—not just newly hired operators—may have to spend some time in class. A willingness to learn new techniques and master new equipment is increasingly important for office machine operators.

Finger dexterity, good eye and hand coordination, and good vision are also important. Billing and calculating machine operators should know simple arithmetic so they can detect obvious errors in computations. Mechanical ability is an advantage, especially for duplicating and tabulating machine operators, who may have to clean and take care of their machines.

Most employers promote from within and



Finger dexterity and good vision are important for office machine operators.

give strong consideration to seniority and job performance as shown by supervisors' ratings. Promotion may be from a routine machine job to a more complex one, or to a related clerical job. Employers often provide any additional training that may be required. In firms having large clerical staffs, office machine operators may advance to jobs training beginners or to supervisory positions as section or department heads.

Employment Outlook

Employment of office machine operators is expected to grow more slowly than the average for all occupations through the 1980's. Most job openings will result from the need to replace workers who die, retire, or leave the occupation. Demand for additional workers will be restrained because of continued advances in office technology which permit even small businesses to adopt computerized recordkeeping and to reduce the requirements for operators in branch offices.

Earnings

According to Bureau of Labor Statistics estimates of earnings for clerical workers in urban areas, bookkeeping machine operators averaged \$167 a week in 1978. Those with more experience earned \$189. Machine billers earned somewhat more. Those operating billing machines averaged \$195.

In the Federal Government, the starting salary for office machine operators in early 1979 was \$6,561 a year. Those with some experience began at \$7,422 a year.

Billing and bookkeeping machine operators earned slightly less than the average for all nonsupervisory workers in private industry, except farming.

Related Occupations

Workers in a number of other occupations operate office equipment. Among these are clerk typists, computer operators, peripheral equipment operators, keypunch operators, cashiers, and typists.

Sources of Additional Information

See the statement on clerical occupations for sources of additional information.

Postal Clerks

(D.O.T. 243.367-014)

Nature of the Work

Most people are familiar with the post office window clerk who works behind the counter selling stamps or accepting parcel post. However, the majority of postal clerks

are distribution clerks who sort incoming and outgoing mail in workrooms.

Postal clerks work at local post offices or at large central mail processing facilities. At local post offices postal clerks sort the mail for delivery to individual customers. Incoming mail collected from the local neighborhood boxes is forwarded to the nearest mail processing center where clerks continue the process of sorting and preparing the mail for delivery.

About 300 mail processing centers throughout the country service the local post offices in surrounding areas. Once mail is received at a center, letter-sorting machine clerks, distribution clerks, and mailhandlers separate the mail into groups of letters, parcel post, magazines, and newspapers. Then mailhandlers feed the letters through stamp-canceling machines. Afterwards mailhandlers take the mail into other workrooms to be sorted according to destination. There, clerks read the ZIP codes and simply push keys corresponding to the letters' destinations on electronic mail-sorting machines; the letters drop into the proper slots. Finally, the mail is sent from the mail processing center to local post offices or to other centers for further sorting.

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 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. In large post offices, a window clerk may provide only one or two of these services and may be called a registry, stamp, or money order clerk.

Working Conditions

Working conditions of clerks differ according to work assignments and the amount and kind of laborsaving machinery in the post office. In small post offices, clerks may carry heavy mail sacks from one part of the building to another, and sort the mail by hand. In large post offices and mail processing centers, chutes and conveyors move the mail, and much of the sorting is done by machine. In either case, clerks are on their feet most of the time, reaching for sacks and trays of mail and placing packages and bundles into sacks and trays while walking around the workroom.

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, has frequent contact with the public, generally has a less strenuous job, and rarely has to work at night.

Places of Employment

Two out of every five employees of the U.S. Postal Service were postal clerks in 1978. The majority of the 260,000 postal clerks work at mail processing centers, although many still sort mail and provide window services at local post offices throughout the country. 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 and 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 clerical accuracy and abilities to memorize mail distribution systems, read, and do simple arithmetic. 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 stores. 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. Disabled veterans who have a compensable, service-connected disability of 10 percent or more are placed at the top of the list. 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 mailing 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 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 sometimes work as many as 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 hours week.



Window clerks must be courteous and tactful.

Most clerks begin as part-time flexible employees and become full-time workers as vacancies occur. Full-time clerks may bid for preferred assignments such as the day shift, a window job, or a higher level non-supervisory position as expeditor or window service technician. Clerks may become supervisors.

Employment 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 increase only slowly 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 retire, die, or transfer to other occupations.

Earnings

In 1978, experienced full-time postal clerks averaged \$17,058 a year, about one and one-half times the average for all non-supervisory workers in private industry, except farming.

Full-time postal clerks started at a base rate of \$14,603 a year and increased to a maximum of \$17,188 after 8 years. Clerks working part-time flexible schedules started at \$7.27 an hour and could advance to \$8.56 an hour after 8 years. All clerks who work night shifts receive 10 percent additional pay. Full-time postal employees have more job security than workers in most other industries. For information on fringe benefits, see the statement on postal service occupations elsewhere in the *Handbook*.

Related Occupations

Although postal clerks play an important role in moving the Nation's mail, mail carriers and mailhandlers also play key roles, and their work and qualifications are closely related to that of postal clerks. Postal clerks sort mail either 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 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 escorts to take them to the proper office.

Many receptionists keep business 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.

Places of Employment

About 588,000 persons worked as receptionists in 1978. Although receptionists work

in almost every kind of organization, almost half work for doctors, dentists, hospitals, nursing homes, and other health-service providers. Large numbers of receptionists also work in insurance companies, banks, factories, and firms providing 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. Courses in English, spelling, typing, elementary bookkeeping, and business practices are useful for receptionists.

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. 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.

Typing, shorthand, business arithmetic, basic accounting, and other useful subjects 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.

Employment 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 leave their jobs. The number of replacements will be quite large because the occupation is large and turnover is high.

Within the fast-growing clerical field, receptionist employment is expected to grow rapidly. 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 very strong growth. The need for receptionists in law firms, management consulting firms, doctors' offices, hospitals, clinics, advertising agencies, and many similar kinds of organizations will contribute to the anticipated employment increase. 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.

Earnings

Full-time switchboard operator-receptionists working in urban areas averaged \$155 a week in 1978. This was just over three-quarters as much as the average earnings for non-supervisory workers in private industry, except farming. Receptionists working in the western United States had average weekly earnings of \$166. Those in southern cities averaged \$147 a week. In the Federal Government, beginning information receptionists with a high school diploma or 6 months of work experience earned \$143 a week in early 1979.

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 section on clerical occupations for sources of additional information.



A pleasant appearance and a good speaking voice are essential to the receptionist.

Secretaries and Stenographers

(D.O.T. 201 and 202)

Nature of the Work

The efficiency of any organization depends upon *secretaries* and *stenographers*, who are at the center of communications within their firm. They process and transmit information to the staff and to persons in other organizations.

Secretaries (D.O.T. 201.362-030) relieve their employers of routine duties so that they can work on other matters. Most secretaries schedule appointments, deal with callers, type, and take shorthand. However, the time spent on these duties varies in different types of organizations.

In offices where dictation and typing are handled in word processing centers, *administrative secretaries* handle all other secretarial duties. (For more information on these centers, see the statement on typists elsewhere in the *Handbook*.) Administrative secretaries often work in clusters of three or four so that they can readily help each other. Because they are released from dictation and typing, they can serve several members of the professional staff. Their duties range from filing, routing mail, and answering telephones to more responsible work such as answering letters, doing statistical research, and writing reports.

Some secretaries do very specialized work for which training is available in business schools and community and junior 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* (201.362-014) compile and record medical records, charts, and correspondence; they need to know medical terminology and hospital or laboratory procedures. *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, pre-

pare 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) 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 *free-lance 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 Congress of the United States, in State legislatures, and in both State and Federal agencies.

Most reporters dictate notes on magnetic tapes that a typist can transcribe later. Because the reporter's transcript is the official record of a proceeding, accuracy is vitally important.

Working Conditions

Working conditions for secretaries are similar to those of other office workers in the same organization. Offices are clean, well-lit, and usually free from high noise levels except during peak typing periods.

These jobs often involve sitting for long periods, and typing often requires working from materials that are difficult to read. Executive secretaries, on the other hand, who perform a number of duties, have the variety in their jobs that many workers prefer.

Places of Employment

Nearly 3.6 million persons worked as secretaries in 1978, including 162,000 legal secretaries and 83,000 medical secretaries. Fewer than 100,000 persons worked as stenographers.

Secretaries and stenographers are employed in businesses and organizations of all kinds. About two-thirds of them, however,

work in banks, insurance companies, real estate firms, government agencies, and other establishments providing services to the public. Most specialized stenographers and secretaries work for doctors, lawyers, and other professional people.

Training, Other Qualifications, and Advancement

Generally, graduation from high school is required for a job as a secretary or stenographer. Many employers prefer applicants who have additional secretarial training at a college or private business school. Courses vary from a few months' instruction in basic shorthand and typing to longer programs teaching specialized skills such as shorthand reporting or legal or medical secretarial work. Shorthand reporters generally must complete a 2-year course in a shorthand reporting school.

An increasing number of private firms and government agencies have their own training facilities where employees can upgrade their skills and broaden their knowledge of the organization. Also, many State and local governments sponsor programs to train unemployed and low-skilled workers for entry level jobs as secretaries.

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.

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 175 words a minute.

Secretaries and stenographers should have good hearing; a knowledge of spelling, punctuation, grammar, and a good vocabulary are essential. The ability to concentrate amid distractions is vital for shorthand reporters. Employers look for persons who are poised and alert, and who have pleasant personalities. Discretion, judgment, and initiative are



In addition to having good typing and shorthand skills, secretaries should be poised, alert, and pleasant.

important for the more responsible secretarial positions.

Many stenographers who improve their skills advance to secretarial jobs; others who acquire the necessary speed through additional training can become shorthand reporters. Secretaries can increase their skills and broaden their knowledge of their company's operations by taking courses offered by the company or by local business schools, colleges, and universities. As secretaries gain knowledge and experience, they can qualify for the designation Certified Professional Secretary (CPS) by passing a series of exams given by the National Secretaries Association. This designation is recognized by a growing number of employers as the mark of achievement in the secretarial field. Many executive secretaries are promoted to management positions because of their extensive knowledge of their employer's operations.

Employment 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. Hundreds of thousands of jobs will become available each year due to growth and the need to replace those who die, retire, or stop working for other reasons.

Demand for secretaries will rise mainly as organizations that require large secretarial staffs expand their operations. New government agencies, particularly at the State and local level; insurance companies offering new forms of protection; and banks providing financial counseling for an increasingly affluent population are just a few of the organizations that will need well-trained and versatile secretaries in the years ahead. Although many new types of automated office equip-

ment have been introduced in recent years, no adverse impact on employment of secretaries is expected. However, jobseekers who are familiar with a wide range of office machines and procedures are likely to have better prospects than other workers.

Persons with secretarial skills should find extensive opportunities for temporary or part-time work as employers increasingly turn to these workers during peak business periods. Such arrangements may be especially attractive to students, persons with family responsibilities, retired persons, and others interested in flexible work schedules.

Employment of stenographers is expected to continue the decline of recent years. The increased use of dictation machines has severely reduced the need for office stenographers, and fewer jobs will be available than in 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 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

According to a Bureau of Labor Statistics (BLS) survey, general stenographers working in private industry averaged \$819 a month in 1978; experienced workers who were highly skilled averaged \$918.

According to the 1978 BLS survey, secretaries to supervisors in small offices earned monthly salaries of \$817. Secretaries to officers in small companies had average monthly salaries of \$893; those working for middle management in large companies averaged \$991. Secretaries having greater responsibilities, such as executive secretaries to corpo-

rate officers, earned average monthly salaries of \$1,085.

Beginning clerk-stenographers in the Federal Government earned from \$697 to \$876 a month in early 1979 depending on education, training, and experience. Shorthand reporters generally earn higher salaries than stenographic office workers. In 1978, according to a survey made by the National Shorthand Reporters Association, earnings of beginning reporters ranged from \$1,000 to \$1,400 a month 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 \$876 to \$1,085 a month, while the average for all secretaries was \$1,081 a month. Stenographers earned slightly less, and secretaries slightly more, than average earnings for all nonsupervisory workers in private industry, except farming.

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 information on careers in secretarial work, write to:

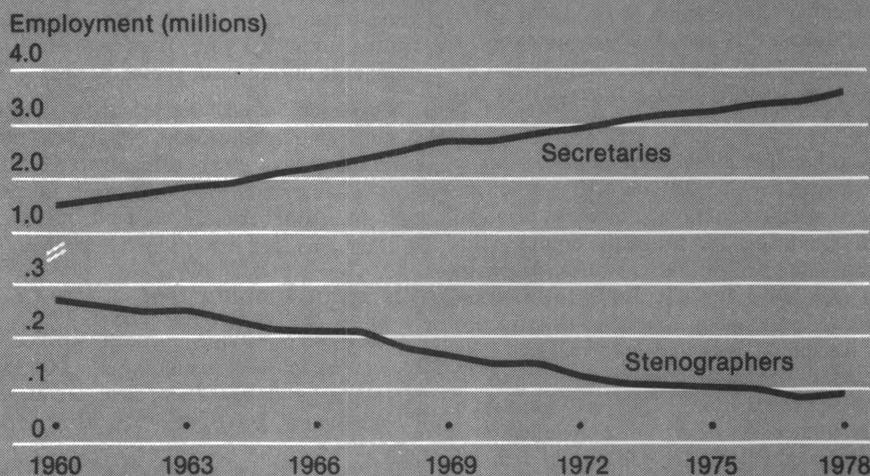
National Secretaries Association (International), 2440 Pershing Rd., Suite G10, Kansas City, Mo. 64108.

Additional information on careers in secretarial work and a directory of business schools are available from:

Association of Independent Colleges and Schools, 1730 M St. NW., Washington, D.C. 20036.

High school students interested in careers as legal secretaries may request the pamphlet

Employment of secretaries has risen substantially, while demand for stenographers has declined



Source: Bureau of Labor Statistics

"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, 18 Park St. SE., Vienna, Va. 22180.

Shipping and Receiving Clerks

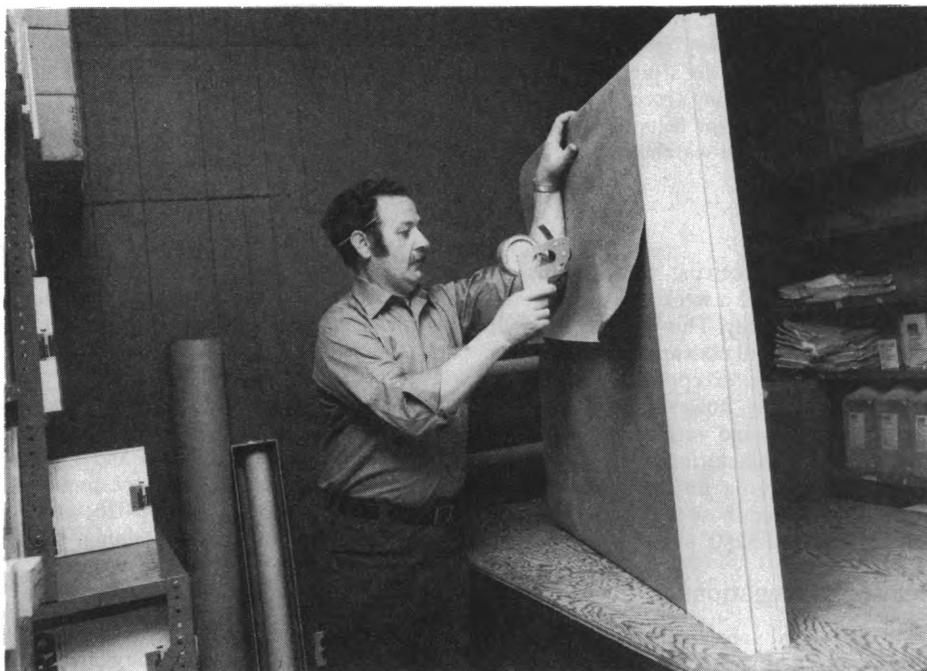
(D.O.T. 219.367-030; 222.137-030 and -034, .367-058, .387-050, and .687-018 through -034; 248.362-010, .367-014; and 920.687-162)

Nature of the Work

Shipping and receiving clerks keep track of goods transferred between businesses and their customers and suppliers. In small companies, one clerk may record all shipments sent out and received; in larger companies, a number of clerks take care of this record-keeping.

Shipping clerks are responsible for all shipments leaving a business place. Before goods are sent to a customer, these clerks check to be sure the order has been filled correctly, and may fill the order themselves. They obtain merchandise from the stockroom and wrap it or pack it in shipping containers. Clerks also put addresses and other identifying information on packages, look up and compute either freight or postal rates, and record the weight and cost of each shipment. They also may prepare invoices and furnish information about shipments to another part of the company, such as the accounting department. Once a shipment is checked and ready to go, shipping clerks may move it to the shipping dock and direct its loading into trucks according to its destination. Shipping and receiving clerks in small businesses may perform some stock clerk duties. (For more information about the additional duties of shipping clerks in small firms, see the statement on stock clerks elsewhere in the *Handbook*.)

When shipments arrive, receiving clerks perform tasks similar to those of shipping clerks. They determine whether their employer's orders have been correctly filled by verifying incoming shipments against the original order and the accompanying bill of lading or invoice. They record the shipment and the condition of its contents. Clerks also arrange for adjustments with shippers whenever merchandise is lost or damaged. The job may also include routing or moving shipments to the proper department, warehouse section, or stockroom and providing information that is needed to compute inventories.



Shipping and receiving clerks may prepare material for shipment.

Working Conditions

Although shipping and receiving clerks generally work in warehouses or in shipping and receiving rooms, they may spend considerable time on outside loading platforms. Workplaces often are large, unpartitioned areas that may be drafty, cold, and littered with packing materials.

Most clerks have to stand for long periods while they check merchandise. Locating numbers and descriptions on cartons often requires a great deal of bending, stooping, and stretching. Also, under the pressure of getting shipments moved on time, clerks sometimes may help load or unload materials in the warehouse.

Night work and overtime, including work on Saturdays, Sundays, and holidays, may be necessary when shipments have been unduly delayed or when materials are needed immediately on production lines. Most shipping and receiving clerks receive time and one-half for work over 40 hours.

Places of Employment

About 461,000 persons worked as shipping and receiving clerks in 1978. More than half worked in factories and about one-third were employed by wholesale houses or retail stores. Although jobs for shipping and receiving clerks are found throughout the country, most clerks work in urban areas, where many factories and wholesale houses are located.

Training, Other Qualifications, and Advancement

High school graduates are preferred for beginning jobs in shipping and receiving departments. Business arithmetic, typing, and other high school business subjects are helpful. The ability to write legibly and keep or-

derly records is important. Dependability and an interest in learning about the firm's products and business activities are other qualities that employers seek. In addition, shipping and receiving clerks should be able to work under close supervision at repetitive tasks.

New employees usually are trained on the job by an experienced worker. As part of their training, they often file, check addresses, attach labels, and check items included in shipments. As clerks gain experience, they may be assigned tasks requiring a good deal of independent judgment, such as handling problems with damaged merchandise, or supervising other workers in shipping or receiving rooms.

A job as a shipping or receiving clerk offers a good opportunity for new workers in a firm to learn about their company's products and business practices. Some clerks may be promoted to head shipping or receiving clerk, warehouse manager, or purchasing agent. Very experienced workers with a broad understanding of shipping and receiving may enter related fields such as industrial traffic management. (Industrial traffic managers and purchasing agents are discussed elsewhere in the *Handbook*.)

Employment Outlook

Employment of shipping and receiving clerks is expected to increase about as fast as the average for all occupations through the 1980's. The number of shipping and receiving clerks will not increase as much as office clerical workers such as secretaries or bank clerks, however, largely because so many shipping and receiving clerks work in manufacturing and trade, industry sectors that are among the slowest growing in the economy.

Further, employment of shipping and re-

ceiving clerks will continue to be affected by automation. Growing numbers of firms are using computers to store and retrieve shipping and receiving records. The increased use of conveyor belts to move shipments also will make warehouse operations more efficient.

Earnings

Shipping and receiving clerks in urban areas averaged \$232 a week in 1978, according to a recent survey. This is about as much as the average for all nonsupervisory workers in private industry, except farming. Salaries varied substantially, however, by type of employer. Shipping and receiving clerks employed by manufacturing firms averaged \$227, those working for wholesale houses averaged \$249, and those employed by public utilities averaged \$280.

Related Occupations

Shipping and receiving clerks record, check, and often store the materials that a company receives. They also process and pack goods for shipment. Other workers who perform similar duties are stock clerks, material clerks, distributing clerks, routing clerks, and order fillers.

Sources of Additional Information

See the section on clerical occupations for sources of additional information.

Statistical Clerks

(D.O.T. 206.387-010, 209.362-026 and .387-101, 214.362-010, 215.362-010 and .367-010, 216, 219.482-014, 221.587-030, 222.387-014 and .687-030, and 953.167-010)

Nature of the Work

Administrators and managers in all types of organizations depend on numerical records to help make decisions. Statistical clerks prepare these records and help ensure their accuracy and completeness. Although the occupational title "statistical clerk" covers a number of different jobs, all of them can be grouped into four categories: Recording, compiling and coding, computing and tabulating, and scheduling.

Recording. This work involves collecting and verifying the accuracy of information. *Shipping checkers* (D.O.T. 222.687-030) in manufacturing companies and wholesale and retail businesses ensure that merchandise to be shipped is properly labeled and contains the desired number of items. *Car checkers* (D.O.T. 222.387-014) keep records of shipments as they arrive at or leave a railroad freight terminal. They check the number of railroad cars and verify their contents with the specifications on the invoice. *Talliers* (D.O.T. 221.587-030) record the number of items received, transferred, or produced. They may have a job title that indicates the kind of items they count. For example, lum-

ber talliers or lumber checkers record the amount and type of lumber processed in sawmills; pit recorders collect production data in the steel industry.

Compiling and coding. In organizations of all types, information must be properly filed, verified, or prepared for data processing. *Posting clerks* (D.O.T. 216.587-014) do this work by making entries in registers and journals. They receive and sort records of shipments, production, and financial transactions to provide company officials with current information on business activities. *Classification clerks* (D.O.T. 206.387-010) record data systematically for easy location. *Coding clerks* (D.O.T. 209.387-010) convert information obtained from records and reports into computer codes for data processing. *Personnel clerks* (D.O.T. 209.362-026) gather and file information on the training, skills, job duties, work history, and wages of a firm's employees. Their work may include some typing and preparation of reports.

Computing and tabulating. Organizations frequently use numerical records for reports and research. Statistical clerks gather information from records to present in a chart or table for analysis. *Actuarial clerks* (D.O.T. 216.382-062) use formulas, statistical charts, and insurance rate books to assist actuaries in determining insurance rates for company customers. They also prepare charts and tables for studies on general insurance practices. *Policy checkers* (D.O.T. 219.482-014) verify the accuracy of insurance company records. *Statistical clerks* (D.O.T. 216.382-062) are employed by government agencies, business firms, health care facilities, and research organizations to calculate numerical data and prepare charts and tables on topics such as population, housing, health, and business conditions. *Demurrage clerks* (D.O.T. 214.362-010), employed by rail-

roads, use rate tables to compute railway freight charges and calculate the weight of shipments or distance railroad cars have traveled.

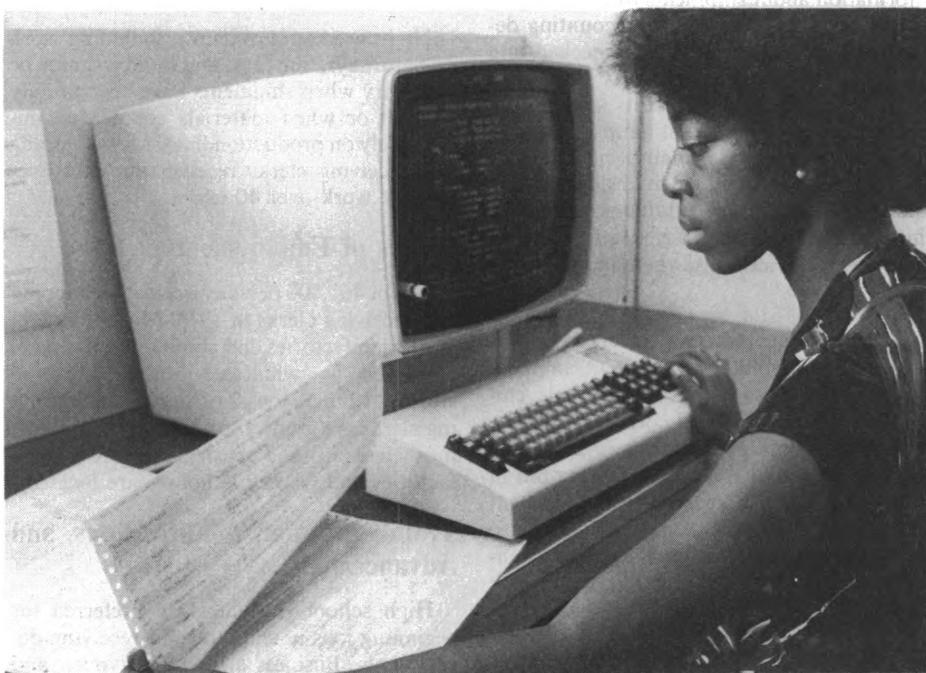
Scheduling. Statistical clerks may schedule business activities that involve the movement of people and things to assure that these activities run smoothly and efficiently. For example, *assignment clerks* (D.O.T. 215.367-010) in bus companies assign drivers to meet riders' transportation needs. Drivers are selected on the basis of experience, seniority, and nature of the assignment. *Crew schedulers* (D.O.T. 215.362-010) do similar work for airlines; they assign pilots to scheduled flights and log the mileage each pilot has flown. *Gas dispatchers* (D.O.T. 953.167-010) determine the proper pressure in a natural gasline to meet customers' requirements after considering information such as weather, time of day, and other factors that affect the use of gas.

Working Conditions

Most statistical clerks are employed in offices where working conditions generally are good. Work areas are clean, well-lighted, and free from loud noises. Not all clerks work in offices, however. For example, talliers and shipping checkers are stationed where a company produces, ships, or receives products or raw materials. In such cases, clerks may work alongside production workers and material handlers. These clerks must be careful as they move about these fast-paced operations.

Places of Employment

About 377,000 persons worked as statistical clerks in 1978. Although statistical clerks are employed in nearly every industry, over half of them worked in finance, insurance,



Statistical clerks increasingly use data processing equipment.

and real estate firms; manufacturing companies; or government agencies.

Because businesses of almost every size require numerical records, statistical clerks work throughout the United States. Jobs are concentrated, however, in heavily populated cities that are centers of industry and government activities.

Training, Other Qualifications, and Advancement

Most employers prefer to hire high school graduates for statistical clerk jobs. They seek applicants who have an aptitude for working with numbers and the ability to do detailed work. High school students may prepare for jobs as statistical clerks by taking courses in general mathematics, algebra, and geometry. Also recommended are courses in data processing, office procedures, bookkeeping, and typing.

In many companies, general clerks who have become familiar with their employers' record systems and office procedures are promoted to statistical clerk positions. On-the-job training may include the use of calculators, tabulating machines, and typewriters.

Statistical clerks must be familiar with the items or information they observe and record. For example, lumber checkers must know the various types and qualities of wood products. In preparing data for processing, coding clerks must use the proper computer codes to avoid errors.

Statistical clerks should be able to do prompt and accurate work under close supervision. Also, they should be tactful and even tempered when working with others in the same office.

Most employers follow a promotion-from-within policy that allows experienced workers to qualify for more responsible jobs as they become available. Qualified statistical clerks may perform more difficult assignments or advance to supervisory positions. Some statistical clerks are able to advance to a technician level where they may deal with the technical problems of statistical research projects. Some clerks become computer programmers.

Employment Outlook

Employment of statistical clerks is expected to grow about as fast as the average for all occupations through the 1980's. In addition to job opportunities arising from this growth, many additional openings will occur as clerks die, retire, or leave the occupation for other reasons.

This occupation includes a wide range of jobs, and prospects are better in some areas than in others. Some routine jobs, for example, may be eliminated as computers are used increasingly to collect and process information. However, statistical clerks in jobs that require personal contact or involve the preparation of data for computer analysis are expected to be in great demand.

Among the factors that will contribute to the demand for statistical clerks is the expected increase in business and government activities, including projects requiring the collection and processing of large amounts of numerical data. In addition, administrators increasingly will rely on numerical records to analyze and control all aspects of their organization's work.

Earnings

Limited information indicates that beginning statistical clerks earn about as much as workers in other entry level clerical jobs such as office clerks or file clerks; salaries for these workers ranged between \$129 and \$149 a week in 1978. The entrance salary for beginning statistical assistants employed by the Federal Government was \$161 a week in 1978.

Experienced workers such as accounting clerks who perform statistical work earned between \$168 and \$215 a week in 1978. Earnings are highest in manufacturing, transportation, and utilities industries; they tend to be lower in retail trade; finance, insurance, and real estate; and service industries.

Related Occupations

Other workers perform calculations, keep numerical records, and prepare statistical reports for use by other departments in a company. Among these are accounting clerks, bookkeepers, payroll clerks, and insurance clerks.

Sources of Additional Information

See the statement on clerical occupations for sources of additional information.

Stock Clerks

(D.O.T. 206.387-030; 209.367-054; 222.137-034; .367-010, -038,-042, and -062; .587-030 and -050; .687-010; 249.367-066; and 969.367-010)

Nature of the Work

Keeping track of supplies and equipment is important in all kinds of businesses. Well-balanced inventories and accurate record-keeping help prevent production slowdowns and lost sales.

Stock clerks control the flow of supplies in and out of stock rooms. They receive, unpack, and store incoming merchandise or material. When necessary, they report damaged or spoiled goods. They also issue equipment and supplies; keep track of the number of items in storage; and reorder things that are in short supply. On outgoing orders, they may check the items for quality and quantity and sometimes make minor repairs or adjustments.

Materials are stored in bins, on the floor, or on shelves according to the plan of the stockroom. Stock clerks organize and mark items with identifying codes or prices so that

inventories can be located quickly and easily. They keep records of items entering or leaving the stockroom. Sometimes they label, pack, crate, or address goods for delivery.

Stock clerks working in small firms also may perform various duties usually handled by shipping and receiving clerks. (For more information about the additional duties of stock clerks in small firms, see the statement on shipping and receiving clerks elsewhere in the *Handbook*.) In large firms with specialized jobs, *inventory clerks* periodically count items on hand and make reports showing stock balances. *Procurement clerks* work in factories and prepare orders for the purchase of new equipment.

Working Conditions

Although stock clerks usually work in relatively clean, heated, and well-lighted areas, workers are on their feet much of the day. The job involves considerable bending and lifting.

Working conditions may vary depending on the items they handle. For example, stock clerks who handle refrigerated goods will spend some time in cold storage rooms. Those who handle construction materials such as bricks and lumber must do much walking and climbing to note the condition and quantity of items.

Places of Employment

About 507,000 persons worked as stock clerks in 1978. About two-thirds of them worked in factories, wholesale firms, and retail stores. Others were employed by airlines, government agencies, schools, hospitals, and other organizations that keep large quantities of goods on hand. Jobs for stock clerks are found in all parts of the country, but most work in urban areas where factories, warehouses, and stores are concentrated.

Training, Other Qualifications, and Advancement

Although there are no specific educational requirements for beginning stock clerks, employers prefer high school graduates. Reading and writing skills and a basic knowledge of mathematics are necessary; typing and filing abilities also are useful. Good health, especially good eyesight, is important. Generally, those who handle jewelry, liquor, or drugs must be bonded.

Stock clerks usually receive on-the-job training. New workers begin with simple tasks such as counting and marking stock. Basic responsibilities of the job usually are learned within several weeks. As they progress, stock clerks learn to keep records of incoming and outgoing materials, take inventories, and order supplies. In small firms, stock clerks may advance to sales positions or become assistant buyers or purchasing agents. In large firms, stock clerks can advance to more responsible stock handling jobs such as invoice clerk, stock control clerk, or procurement clerk. A few may be



Fully stocked shelves insure that sales of fast-moving products are not interrupted.

promoted to warehouse manager. This job involves a wide range of duties and responsibilities and normally requires extensive stock room experience and additional education.

Employment Outlook

Employment of stock clerks is expected to increase about as fast as the average for all occupations through the 1980's. Stock clerks will not experience the rapid employment growth projected for office clerical workers such as secretaries or bank clerks, however. Growth will be slower than in other clerical occupations largely because so many stock clerks work in manufacturing and trade, industry sectors that are among the slowest growing in the economy. Further, employment of stock clerks will continue to be affected by automation. Computers are used for inventory control in many concerns, and automated storage systems have reduced the need for frequent shifting of stock by hand. Nevertheless, many job openings for stock clerks will occur each year as employment rises and as workers die, retire, or transfer to other jobs.

In large companies, people who apply for entry level, unskilled work may be placed in stock clerk positions. Employers generally fill such jobs quickly. Individuals who specifically seek work as a stock clerk therefore may have to apply at a number of concerns to find employment.

Earnings

Experienced stock clerks earned average weekly salaries of \$226 in 1978, according to the limited data available. This was slightly above the average for nonsupervisory workers in private industry, except farming.

In the Federal Government, beginning

stock clerks without experience were paid \$143 a week in early 1979; those with some education beyond high school received \$161 a week. Experienced stock clerks in the Federal Government averaged about \$194 a week in 1978.

Stock clerks generally receive time and one-half for work over 40 hours. Overtime may be required when large shipments are delivered and when inventory is taken.

Related Occupations

Other workers also handle, organize, and store materials for a company. Among these are order fillers, shipping and receiving clerks, material clerks, distributing clerks, and routing clerks.

Sources of Additional Information

See the section on clerical occupations for sources of additional information.

Typists

(D.O.T. 203)

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 do other office tasks, including answering telephones, filing, and operating office machines such as copiers and calculators.

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. *Variety typists* (D.O.T. 203.382-026) produce master copies, such as stencils, on machines similar to typewriters. *Transcribing machine operators* (D.O.T. 203.582-058) type letters and reports as they listen to dictation recorded on magnetic tape. Other typists who have special duties include *policy writers* (D.O.T. 203.582-066) in insurance companies, and *mortgage processing clerks* (D.O.T. 203.382-022) in banks.

Some offices group many typists in word processing centers to handle the transcription and typing for several departments. These *magnetic-tape typewriter operators* (D.O.T. 203.584-034) produce letters and reports on high-speed typing machines from material stored in a programmed memory. They eliminate a great deal of re-typing because they make corrections before producing the final copy. *Word processing supervisors* (D.O.T. 203.137-010) coordinate the activities of workers who operate magnetic-tape typewriters and composing machines.

Working Conditions

Typists work in offices and have working conditions similar to those of other office employees. They must sit for long periods and sometimes must contend with high noise levels caused by nearby office machines.

Places of Employment

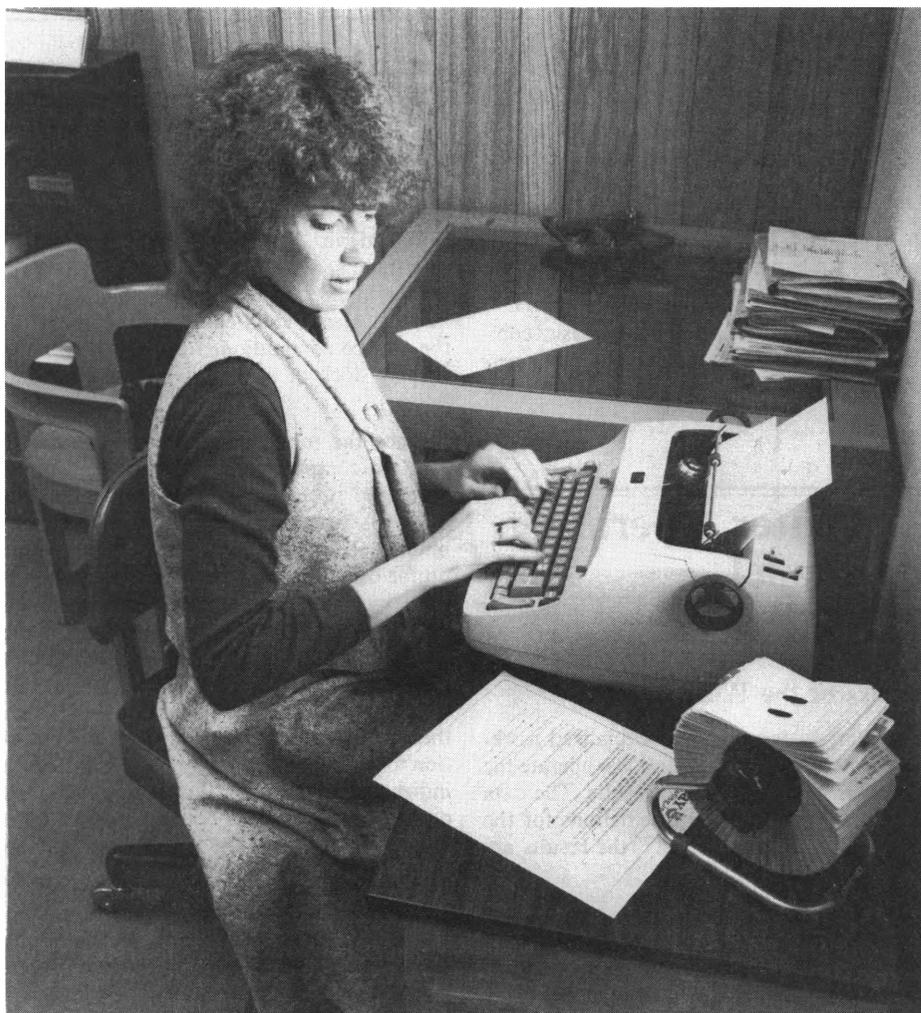
About 1 million persons worked as typists in 1978. In addition, many other workers—including secretaries, newspaper reporters, writers, and editors—used typing skills in the performance of their jobs.

Part-time employment is readily available for workers with clerical skills. Typists are employed throughout the entire economy. About half of them work in factories, banks, insurance companies, real estate firms, and government agencies.

Training, Other Qualifications, and Advancement

Typists generally need a high school diploma. Good spelling, punctuation, and grammar are essential. The ability to operate office equipment, such as copying and adding machines, and a knowledge of office procedures, are assets.

An increasing number of companies and government organizations have typist training programs to help employees learn or up-



Successful typists are neat, accurate, and able to concentrate on details.

grade 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.

Many employers test the speed and accuracy of applicants for typing jobs. Most jobs require a speed of 50 to 60 words per minute. All typists who transcribe recorded dictation need sharp hearing and must be especially

good in spelling. Typists should be neat, accurate, and able to concentrate amid distractions.

As beginners increase their skills, they often advance to higher level typing jobs. Some typists are promoted to supervisor jobs in word processing centers. Others who master additional skills can move into secretarial jobs.

Employment 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. Also, many job openings will occur every year because turnover in this occupation is very high.

Continued growth of the economy, particularly in industries that generate vast quantities of written records and correspondence, will assure very good prospects for typists in the years ahead. Demand should be particularly strong for highly skilled workers and those who can handle other office jobs in addition to typing. Many employers will prefer typists who are familiar with word processing equipment. Because an increasing number of employers are using temporary and part-time workers during peak business periods, opportunities should continue to be excellent for typists who do not wish to work full time.

Earnings

According to a 1978 survey, beginning typists averaged \$162 a week. Those with experience earned \$193 a week, slightly less than the average earnings for nonsupervisory workers in private industry, except farming.

In the Federal Government, the starting salary for typists without experience was \$143 a week in early 1979, compared with \$181 a week for those with experience. Average weekly earnings for all typists in the Federal Government were \$174 in 1978.

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

See the statement on secretaries and stenographers for places to write for more information on clerical jobs.

Computer and Related Occupations

Since 1951 when the first computer was installed for commercial use, computer systems have become an increasingly important part of everyday life. Today these machines bill customers, pay employees, record airline and hotel reservations, help forecast weather, and monitor factory production processes. Scientific and engineering researchers rely on computer systems to solve complex equations as well as to collect, store, and sort vast amounts of data. Microcomputers are used at home for business and pleasure.

Workers in computer and related occupations design systems for processing information, write instructions and translate them into machine-readable language, and operate computers and peripheral equipment such as remote terminals.

Most computer careers require some type of specialized training. A college degree is becoming increasingly important for systems analysts and programmers—especially for those working in scientific and engineering research operations. Computer operators usually need a high school diploma, and specialized training and experience may be considered more important than formal education beyond high school. For all computer occupations, employers stress the importance of learning on the job.

In addition to technical knowledge and skills, computer personnel must be able to concentrate and should enjoy working with details. Those who operate equipment—data entry or console operators, for example—must have manual dexterity and some me-

chanical aptitude. Programmers and systems analysts must be able to think logically and should enjoy solving problems.

This chapter describes three basic computer occupations: Computer operating personnel, programmers, and systems analysts.

Computer Operating Personnel

(D.O.T. 203.582-022, -030; 206.387-030; 208.685-030; and 213.132-010 and -014, .362-010, and .382-010)

Nature of the Work

All data systems require specialized workers to enter data and instructions, operate the computer, and retrieve the results. The data 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* (D.O.T. 203.582-030) 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* (D.O.T. 203.582-022) 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 it is entered directly into the computer. In some newer systems, data enters the computer at the source of creation, 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* (D.O.T. 213.-362-010), 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* (D.O.T. 213.382-010) and *card-tape-converter operators* (D.O.T. 213.382-010)—perform this function.

Frequently, data on punched cards, magnetic tape, or disks are kept for future use. *Tape librarians* (D.O.T. 206.387-030) 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 activities between the programmer and the operations department.

Working Conditions

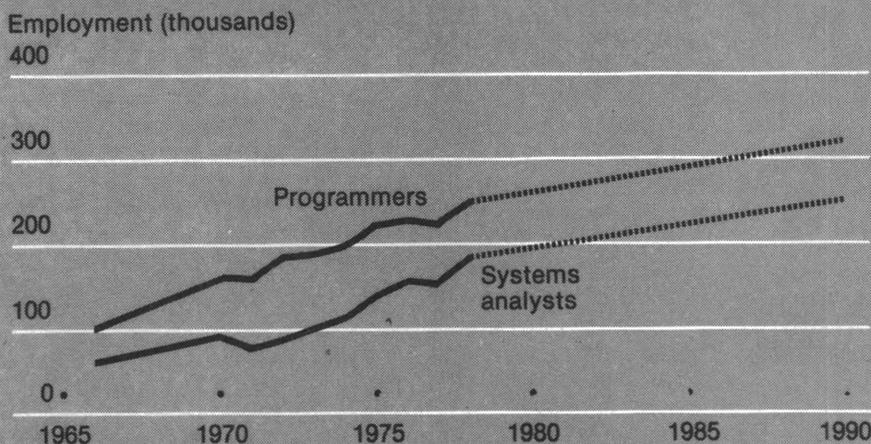
Because electronic computers must be operated at carefully controlled temperatures, operators work in well-ventilated rooms; air-conditioning counteracts the heat generated by machine operations. When the equipment is operating, the computer room can be noisy.

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.

Places of Employment

About 666,000 persons worked as console, auxiliary equipment, and keypunch operators in 1978.

Employment of programmers and systems analysts, negligible in 1960, is expected to exceed half a million workers by 1990



Source: Bureau of Labor Statistics



Computer operators must feel comfortable working with machines.

Although workers in these occupations are employed in almost every industry, most work in manufacturing firms, wholesale and retail trade establishments, banks, and government agencies. Many computer and peripheral equipment operators work for insurance companies and firms that provide data processing services for a fee.

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 applicants to have a high school education, and many prefer console operators to have some community or junior college training, 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 opera-

tors 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, as data entry techniques become 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.

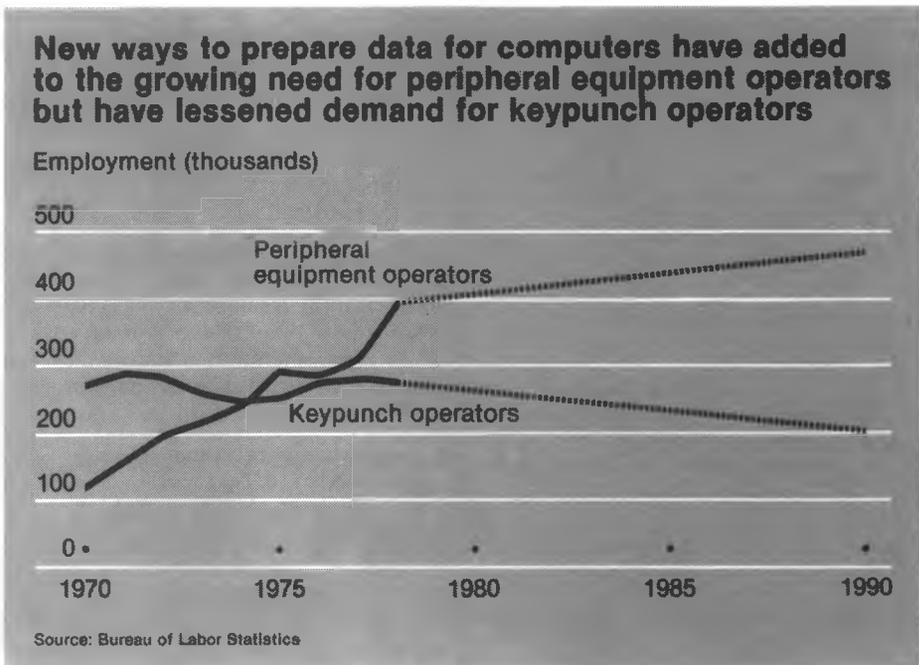
Console operators also may be promoted to supervisory positions, or to jobs that combine supervision and console operation. Through on-the-job experience and additional training, some console operators advance to jobs as programmers.

Employment Outlook

Changes in data processing technology will have differing effects on computer operating occupations over the next decade. Employment of console and peripheral equipment operators is expected to rise about as fast as the average for all occupations through the 1980's while employment of keypunch operators should continue the decline of recent years.

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 pri-



mary 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, several thousand openings will occur each year as workers die, retire, or transfer out of the occupation.

Earnings

Weekly earnings of keypunch operator trainees in private industry averaged around \$160 in 1978, 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 \$175. Experienced workers earned from \$220 to \$250, and lead operators earned from \$260 to \$300 weekly. The average weekly earnings for tape librarians in 1978 was \$190.

In the Federal Government, console operators and keypunch operators without work experience started at about \$140 a week. Throughout the economy in 1978, 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.

Programmers

(D.O.T. 020.162-014 and .167-022)

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 problem 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 in the following chapter.) 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 a programmer 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.

Places of Employment

In 1978, about 247,000 persons worked as computer programmers. Most were employed by manufacturing firms, banks and insurance companies, data processing service organizations, and government agencies.

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.

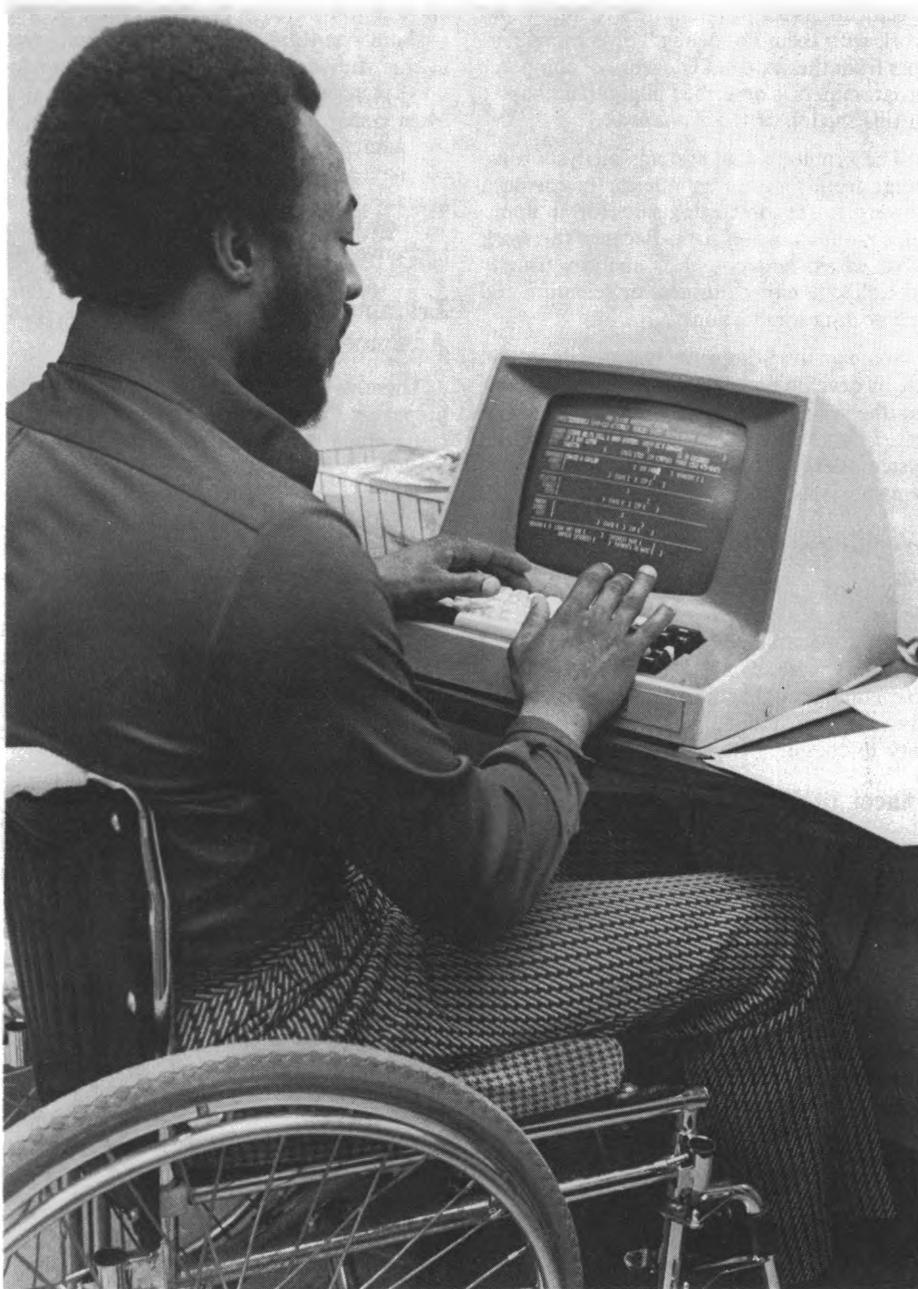
Training, Other Qualifications, and Advancement

There are no universal training requirements for programmers 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, accounting, and business administration. Occasionally, workers who are experienced in computer operation or payroll accounting but 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 no significant work experience.

Computer programming is taught at pub-



Programmers write detailed instructions that list the steps the computers must follow to solve a problem.

lic 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.

In hiring programmers, employers look for people who can think logically and are capa-

ble 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.

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 further ad-

vancement 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.

Employment 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 and business management services, and in organizations involved in research and development. In addition to job openings resulting from growth of the occupation, several thousand 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 deaths or retirements. 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 processes once done by hand are automated, but employment will not grow as rapidly as in the past for several reasons. Improved software, such as utility programs that can be used by other than data processing personnel, will simplify or eliminate some programming tasks. Also, employment of programmers in data processing firms is not expected to rise as fast as in recent years. Technology has reduced both the size and cost of computer hardware, bringing a computer system within reach of small businesses. As more small firms install their own computer rather than rely on a data processing firm, employment growth in these data processing firms may slow somewhat.

Demand throughout the economy, however, should remain strong over the next decade. Prospects should be brightest for college graduates who have had computer-related courses, particularly for those with a major in computer science or a related field. Graduates of 2-year programs in data processing technologies also should find ample opportunities, although generally limited to business applications.

Earnings

Average weekly earnings of programmer trainees in private industry ranged from \$240 to \$250 in 1978, according to surveys conducted in urban areas by the Bureau of Labor Statistics and firms engaged in research on data processing occupations. 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 \$430 a week compared to \$360 for applications programmers. Average weekly salaries for lead systems programmers were \$465, compared to \$415 for lead applications programmers.

In the Federal civil service, the entrance salary for persons with a college degree was about \$200 a week in 1978. In general, programmers earn about twice as much as the average earnings of all nonsupervisory workers in private industry, except farming.

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 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.

Systems Analysts

(D.O.T. 003.167-062, 012.167-066, and 020.062-010)

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 in another chapter in this section of 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.

Places of Employment

About 182,000 persons worked as systems analysts in 1978. Employment of these work-

ers 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, banks, insurance companies, and data processing service organizations. In addition, large numbers worked for wholesale and retail businesses and government agencies.

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 systems, or data processing. Regardless of college major, employers look for people who are familiar with programming languages. Courses in



Analysts begin by discussing a problem to break it down into component parts.

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.

Employment Outlook

Employment of systems analysts is expected to grow faster than the average for all occupations through the 1980's as computer usage expands, particularly in accounting firms and organizations engaged in research and development. In addition to opportunities that will result from growth in 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 continual study of the potential uses of computer systems is resulting 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 we have not yet 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 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 especially for the small computer and geared specifically for problems of small firms.

The outlook for graduates of computer-related curriculums should be excellent. 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 \$300 a week in 1978, according to surveys conducted in urban areas by the Bureau of Labor Statistics and private firms engaged in research on computer occupations. Experienced workers earned from \$370 to \$420, and lead systems analysts earned from \$450 to \$460 weekly. In the Federal Government, the entrance salary for recent college graduates with a bachelor's degree was about \$200 a week in 1978. Overall, systems analysts earn well over twice as much as the average for all nonsupervisory workers in private industry, except farming.

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 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.

Banking Occupations

Commercial banks constitute one of the fastest growing industries in our economy. To keep pace with requirements of the community, they offer a variety of services: Checking, savings, and credit card accounts; commercial and consumer loans; trust fund management; and financial counseling.

Banks employ highly specialized techniques and equipment in very detailed work. Consequently, most employees gain experience and skill through on-the-job training. Although banks usually seek college graduates for officer trainee jobs, many openings exist for high school graduates in other bank positions. Bank employees generally have good opportunities for advancement. They can qualify for better positions by enrolling in programs offered by the American Bankers Association, American Institute of Banking, or State banking associations, or by taking college courses in finance and business.

Bank employees should enjoy working with numbers and be able to perform detailed work. Personal qualifications, such as honesty and the ability to communicate with customers, are important.

This section discusses three categories of banking occupations: Clerks, officers and managers, and tellers.

Bank Clerks

(D.O.T. 209.687-022; 210.382-014, -018, -022, -026, -058; 216.362-014, -018, -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, file clerks, 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 that sorts checks and deposit slips, adds their amounts, and records the tabulations.

Bookkeeping workers are the largest group of bank clerks. The job titles of bookkeepers

generally reflect the kinds of records they keep—for example, Christmas club bookkeepers, 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. *Reconciliation 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 in behalf of bank customers. In addition to duties indicated by their titles, many of these workers do routine typing, calculating, and posting.

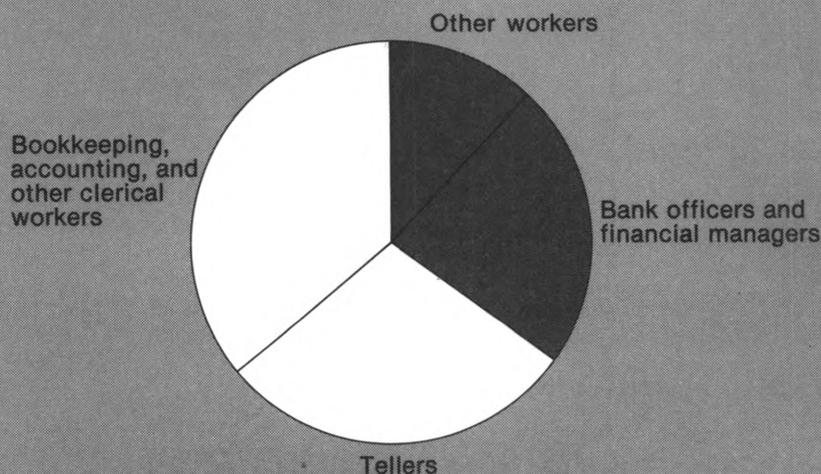
Other clerical employees whose duties and job titles are unique to banking include *country-collection clerks* (D.O.T. 219.362-014), who sort thousands of pieces of mail daily and determine which items must be held at the main office and which should be routed to branch banks for collection; *transit 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; *exchange clerks* (D.O.T. 216.362-018), who service foreign deposit accounts and determine charges for cashing or handling checks drawn against such accounts; *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

More than 60 percent of all workers in banking are clerks



Source: Bureau of Labor Statistics



Some bank clerks provide customers with information about safe deposit boxes.

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 approximately 500,000 clerks in 1978; one-fourth were secretaries or typists, one-third were bookkeepers, and another one-third were office machine operators.

Training, Other Qualifications, and Advancement

High school graduation is considered adequate preparation for most beginning clerical jobs in banks. 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. Some are trained by the bank to operate various office machines. A few start as messengers.

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—may help workers advance. (See statement on the banking industry for information on the Institute's educational program.) In general,

promotion depends upon the worker's performance, qualifications, and motivation as well as the available openings.

Employment Outlook

Employment of bank clerks is expected to grow much faster than the average for other 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 leave their jobs each year. As a result, banking should continue to be a good source of employment for clerical workers.

Jobs for clerks will arise as established banks expand their services and new banks and branches open. Future 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 keypunch 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 banking 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.

Earnings

Beginning salaries for clerical workers depend upon the worker's actual position and length of experience, as well as the size and location of the bank. An inexperienced typist usually earned between \$110 and \$135 a week in early 1979. In general, financial institutions have paid clerical workers lower sala-

ries than have firms in other industries, such as wholesale trade or manufacturing.

Related Occupations

Many clerical skills and abilities found 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 are insurance, mortgage, real-estate, securities, and court clerks.

Bank messengers gather, sort, and distribute various items and documents within and outside of the bank. Other workers who similarly process information are correspondence clerks, expeditors, mail handlers, medical record technicians, and proofreaders.

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 are billing machine operators, keyboard operators, linotype operators, tabulating machine operators, and typists.

Sources of Additional Information

See the statement on the banking industry elsewhere in the *Handbook* for additional information.

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 330,000 officers and managers in 1978.

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 ac-

tivities 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.

Training, Other Qualifications, and Advancement

Bank officer and management positions generally are filled by management trainees, and occasionally 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. In fact, a Master of Business Administration (MBA) in addition to a social science bachelor's degree comes closest to the "ideal" college education. 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. 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. The American Bankers Association (ABA) offers courses, publications, and other training aids to officers on every phase of banking. The American Institute of Banking, an arm of the ABA, has long filled the same educational need among bank support personnel. (See the statement on the banking industry elsewhere in the *Handbook* for more information on these and other training programs sponsored by universities and local bankers' associations.)

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.

Employment Outlook

Through the 1980's, employment of bank officers is expected to increase much 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. Opportunities also will arise as experienced officers leave their jobs. College graduates who meet the standards for management trainees should find good opportunities for entry positions.

Earnings

Officer trainees at the bachelor's level generally earned between \$900 and \$1,000 a month in 1978. Those with master's degrees started at between \$1,100 and \$1,300 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 \$1,600 a month in 1978.



Bank officers provide personal financial assistance to customers.

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 further exposure 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

See the statement on the banking industry elsewhere in the *Handbook* for additional information.



Bank tellers spend most of their time serving customers.

Bank Tellers

(D.O.T. 211.132-010, .362-014, -018, -022, and -026)

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.

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 characterize the job. After a couple of years' work, tellers typically seek other positions.

Employment

About 410,000 tellers were employed in 1978. A large number work part time.

Training, Other Qualifications, and Advancement

In hiring tellers, banks seek people with basic qualities: Clerical skills, friendliness, and attentiveness. Although not required, a high school diploma is generally preferred. Maturity, neatness, tact, and courtesy are important because customers deal with tellers far more frequently than with other bank employees. Although tellers work independently, their recordkeeping is closely supervised. They work with detail and are confined to a small work area.

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.

The conditions governing advancement of tellers are much the same as those for clerks. The teller interested in promotion has access to courses and other sources of additional training. Such self-improvement efforts, coupled with satisfactory 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; those who have had some college or specialized training offered by the banking industry may be promoted to an officer or managerial position. (See the statement on the banking industry for information about the educational programs of the American Institute of Banking.)

Employment 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 stop working 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.

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.

Earnings

Most beginning tellers earned between \$110 and \$135 a week in 1978. Experienced tellers generally earned between \$135 and \$180 a week. The actual salary depends 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 \$135 and \$165 a week in 1978, while note tellers usually earned between \$160 and

\$190 a week. In general, the greater the range of responsibilities the teller performs, the higher the salary.

similar duties include cashiers, toll collectors, post office clerks, auction clerks, and ticket sellers.

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

Sources of Additional Information

See the statement on the banking industry elsewhere in the *Handbook* for additional information on this and other banking occupations.

Insurance Occupations

Insurance protection is an integral part of our lives. It frees policyholders and their beneficiaries from worry about the enormous financial burdens that sometimes result from death, illness, or other losses. Businesses could not operate, nor could most people buy homes or other major items, without the assurance of protection from sudden disaster. Insurance workers adapt policies to meet changing needs, decide which applications can be accepted, establish premium rates on the policies, and investigate and settle claims.

A college degree is increasingly important for managerial, professional, and sales jobs in insurance, although some positions are open to high school graduates who have appropriate experience. Insurance workers in clerical positions generally need a high school diploma. Regardless of their previous training, insurance workers must continually learn while on the job. Many professional associations sponsor courses in all phases of insurance work, and employees are encouraged to participate to prepare themselves for more responsible jobs.

This section describes three insurance occupations: Actuaries, claim representatives, and underwriters. (Statements on the insurance industry and insurance agents and brokers are included elsewhere in the *Handbook*.)

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? Answers to these and similar questions are provided by actuaries who design insurance and pension plans that can be maintained on a sound financial basis. They assemble and analyze statistics to calculate probabilities of death, sickness, injury, disability, unemployment, retirement, and property loss from accident, theft, fire, and other hazards. Actuaries 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 live to 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 the same 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 on problems arising in their company's investment, group underwriting, or pension planning departments. Actuaries in executive positions help determine general 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 positions regulate insurance companies, supervise the operations of State retirement or pension systems, and work on problems connected with unemploy-

ment insurance or workers' compensation. Consulting actuaries set up pension and welfare plans for private companies, unions, and government agencies. They calculate future benefits and determine the amount of the annual employer contribution. Actuaries who are enrolled under the provisions of the Employee Retirement Income Security Act of 1974 (ERISA) evaluate these pension plans and submit reports certifying their financial soundness.

Working Conditions

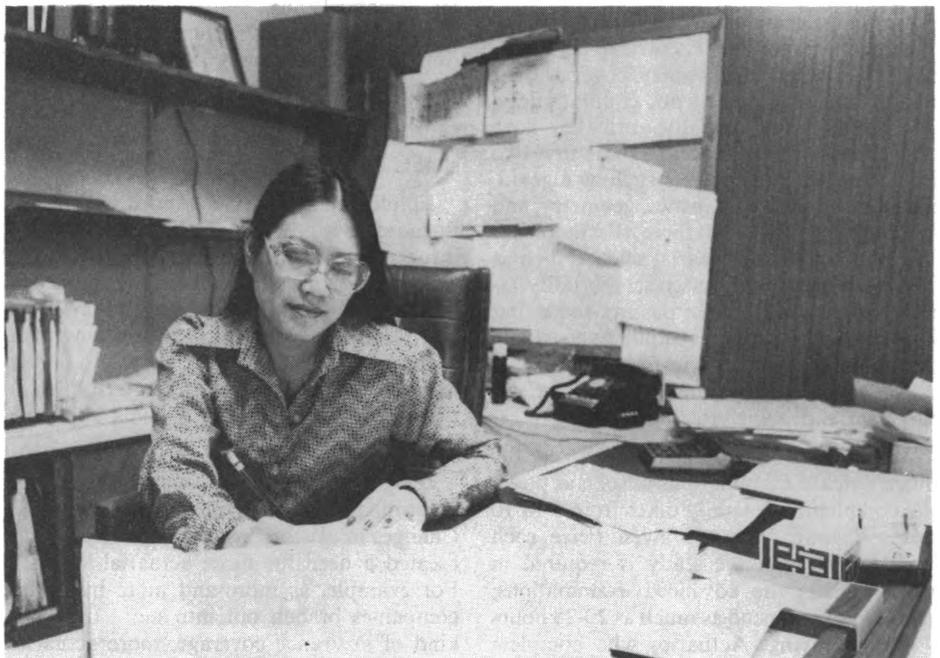
Actuaries have desk jobs that require no unusual physical activity; their offices generally are comfortable and pleasant.

Most actuaries work between 35 and 40 hours a week, although they may be required to work overtime during busy periods. Actuaries may travel to branch offices of their company or to clients.

Places of Employment

Approximately 9,000 persons worked as actuaries in 1978. Four of every 10 actuaries worked New York, Hartford, Chicago, Philadelphia, or Boston.

About two-thirds of all actuaries worked for private insurance companies. Almost 90 percent 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



Actuaries analyze statistical data.

types of insurance policies it offers. Large companies may employ over 100 actuaries on their staffs; others, generally smaller companies, may rely instead on consulting firms or rating bureaus (associations that supply actuarial data to member companies).

Consulting firms and rating bureaus employ about one-fifth of all actuaries. 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 demonstrate a thorough foundation in calculus, probability, and statistics (20-25 hours). Courses in accounting, computer science, economics, and insurance also are useful. Although only 25 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. Of equal importance, however, is the need to pass, while 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 nine 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 career specialty until they have taken about five examinations. The first two test competence in subjects such as algebra, calculus, elementary statistics, geometry, and trigonometry; the next three the more advanced concepts of actuarial science such as theories of compound interest, mortality tables, and risk. Success in passing these first few examinations helps 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 in order to pass the advanced examinations; many actuaries spend as much as 20-25 hours a week studying. Actuaries who complete five examinations in either the life insurance series or the pension series or seven examina-

tions in the casualty series are awarded "associate" membership in their society. Those who have passed 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. Applicants for enrollment must meet certain experience and education requirements as stipulated by the Joint Board.

Beginning actuaries often rotate among different jobs to learn various actuarial operations and to become familiar with different phases of insurance work. At first, their work may be routine, such as preparing tabulations for actuarial tables or reports. 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 other company activities, particularly in underwriting, accounting, or data processing departments. Many advance to top executive positions.

Employment Outlook

Employment of actuaries is expected to rise 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. However, because of the large number of persons expected to receive degrees in actuarial science, mathematics, and statistics, and the large number of students taking actuarial examinations, competition for beginning jobs should remain keen.

Employment in this occupation is influenced to a great extent by the volume of insurance sales, which will continue to grow over the next decade. Shifts in the age distribution of the population through the 1980's 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.

Increased sales, however, are only one determinant of the demand for actuaries. Changes in existing insurance practices have created a need for more actuarial services. For example, as more and more insurance companies branch out into more than one kind of insurance coverage, more actuaries will be needed to establish the rates for the different types of insurance offered. Growth

in sales of relatively new forms of protection, such as dental, prepaid legal, and kidnap insurance also will create additional demand for actuaries. As more States pass competitive rating laws, many companies that previously relied on rating bureaus for actuarial data can be expected to expand existing actuarial departments or create new ones.

The liability of companies for damage resulting from their product 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, medical malpractice and workers' compensation coverage.

Earnings

In 1978, actuaries had average salaries more than twice as high as the average for all nonsupervisory workers in private industry, except farming. New college graduates entering the life insurance field without having passed any actuarial exams averaged \$10,933 in 1978, according to a survey of U.S. companies by the Life Office Management Association (LOMA). Applicants who had successfully completed the first exam received \$12,754 and those who had passed two exams averaged \$13,584.

In the Federal Government, new graduates with the bachelor's degree could start at \$10,500 a year in 1978. Applicants with either 1 year of graduate study or relevant work experience were hired at \$13,000, and those with the master's degree or 2 years' experience started at \$15,900 a year. Actuaries in the Federal Government averaged \$28,350 a year in 1978.

Beginning actuaries can look forward to a marked increase in earnings as they gain professional experience and advance in an actuarial society's examination program. Life insurance companies usually give merit increases averaging from \$566 to \$978 to their actuaries as they pass each successive examination leading to membership in the Society of Actuaries. Associates who received that designation in 1978 averaged \$18,325 a year; salaries for actuaries who become fellows during that year averaged \$27,163. Fellows with additional years of experience earned substantially more—top actuarial executives averaged about \$47,600 in 1978.

Although data are not available for salaries of actuaries in casualty companies or consulting firms, it is believed that salaries for these specialists generally are comparable to those paid by life insurance companies. Most actuaries have liberal vacation policies and other employee benefits.

Related Occupations

Actuaries assemble and analyze statistics as well as apply various statistical techniques 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., N.W., Washington, D.C. 20006.

Casualty Actuarial Society, 110 Plaza, 250 West 34 St., New York, N.Y. 10001.

Society of Actuaries, 208 South LaSalle St., Chicago, Ill. 60604.

Claim Representatives

(D.O.T. 168.267-014, 241.217-010, .267-018, and 249.262-010)

Nature of the Work

Fast and fair settlement of all claims is essential to any insurance company if it is to meet its commitments to policyholders and also protect its own financial well-being. 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 ad-

justers are allowed to issue checks on company funds; most, however, submit their 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 make their own schedules of the activities needed to dispose of a claim properly. They also keep written or taped records of information obtained from witnesses and other sources and prepare reports of their findings.

In life insurance companies, the counterpart of the claim adjuster is the *claim examiner*, who investigates questionable claims or those exceeding a specified amount. They 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 inves-

tigate 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 may 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.

Working Conditions

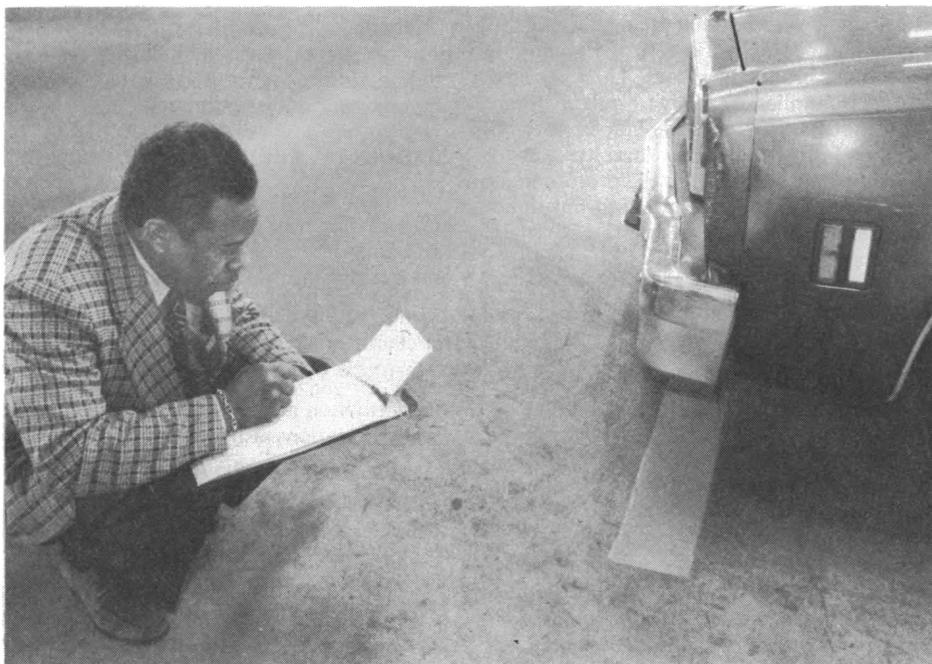
Claim adjusting is not a desk job. It requires that a person be physically fit because much of the day may be spent in traveling, walking about outdoors, and climbing stairs. Adjusters may have to work evenings or weekends in order to interview witnesses and claimants. Since most companies provide 24-hour claim service to their policyholders, some adjusters always must be on call. (See the statement on the insurance industry for additional information on working conditions and employee benefits.) 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 need to travel occasionally.

Places of Employment

About 169,000 persons worked as claim representatives in 1978. The majority of claim adjusters worked for insurance companies that sell property and liability coverage. Some were employed by independent adjusting firms that contract 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" usually are retained by banks, financial organizations, and other business firms to handle fire and other losses to property. They negotiate claims against insurance companies and deal with adjusters for such companies.

Most claim examiners worked for life insurance companies in large cities, such as New York, San Francisco, Chicago, Dallas,



Recording the details of damage assists agents in accurately estimating repair costs.

and Philadelphia, where most home offices are located.

Training, Other Qualifications, and Advancement

Although a growing number of insurance companies prefer claim representatives to have a college degree, 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 college 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 beginning claim adjusters and examiners on-the-job training and home study courses. 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, FLMI (Fellow, Life Management Institute) upon successful completion of eight written examinations.

About three-fourths of the States require adjusters to be licensed. Despite wide variation in State licensing requirements, applicants usually must comply with one or more of the following: Pass a written examination covering the fundamentals of adjusting; furnish character references; be 20 or 21 years of age and a resident of the State; offer proof that they have completed an approved course in insurance or loss adjusting; 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 the respect and cooperation of people from different backgrounds. 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 tactfully. Examiners need to be familiar with medical and legal terms and practices and Federal and State insurance laws and regulations. Because 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 years or more of college. Employees who show unusual competence in claims work or outstanding 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 other departments, such as underwriting or sales.

Employment 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 a steadily rising number of workers will be entering their most productive years. These workers and their families are likely to seek insurance protection as they purchase homes, automobiles, and other consumer durables. New or expanding businesses will need protection for new plants and equipment and for insurance covering their employees' health and safety. As more people live and work in densely populated areas, the increased risk of automobile accident, fire, or theft should result in a greater number of claims.

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 highly complex types of business insurance such as

marine cargo, workers' compensation, and product liability.

A similar situation exists for claim examiners. Employment of examiners in casualty companies should rise about as fast as for adjusters; however, much slower growth is expected for life insurance examiners as increased use of computers enables them to process more claims, especially routine ones and those that arise under group policies.

Earnings

According to a survey of property and liability companies, claim adjusters averaged about \$14,760 a year in 1978; inside adjusters earned average salaries of about \$11,215. Most public adjusters are paid a percentage of the amount of the settlement—generally 10 percent. Adjusters are furnished a company car or are reimbursed for use of their own vehicles for business purposes. Salaries of claim adjusters are about one and one-half times the average earnings for all nonsupervisory workers in private industry, except farming; salaries of inside adjusters are slightly above the average for all nonsupervisory workers.

A survey of life insurance companies by the Life Office Management Association revealed that claim examiners earned average salaries of \$13,870 a year in 1978. According to the survey of property and liability companies, casualty claim examiners averaged \$17,100. Claim supervisors in casualty companies and life companies averaged \$18,650 a year. Claim examiners earn more than one and one-half times the average for all nonsupervisory workers in private industry, except farming.

Most insurance companies have liberal vacation policies and other employee benefits.

Related Occupations

Other workers who have to make critical 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.

American Alliance of Insurance, 20 N. Wacker Dr., Chicago, Ill. 60606.

The National Association of Independent Insurers, Public Relations Department, 2600 River Rd., Des Plaines, Ill. 60018.

For information about public insurance adjusting, contact:

Career information on life insurance claim
examining is available from:

American Council of Life Insurance, 1850 K St.
N.W., Washington, D.C. 20006.

Underwriters

(D.O.T. 169.167-058)

Nature of the Work

Insurance companies assume millions of dollars in risks each year by transferring the chance 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). Because these decisions seldom are reviewed at a higher level, underwriters have great responsibility. 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 a policy 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 to fill 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. Some underwriters, called commercial account underwriters, handle business insurance exclusively. They often must evaluate a firm's entire operation in appraising its insurance application. Casualty companies are doing more "package" underwriting, whereby various types of risks are insured under a single policy. In such situations, the underwriter must be familiar with several different lines of insurance rather than specializing in a single line.

An increasing proportion of total insurance sales is being made through group contracts. A standard group insurance policy insures all persons in a specified group through a single contract at uniform premium rates; this type of group policy generally provides life or health insurance protection. The group underwriter analyzes the overall composition of the group to be sure that total risk is not excessive. A different type of group policy that has gained widespread acceptance is the policy that provides the members of a group—a labor union, for example—with individual policies geared to their own circumstances. These policies generally are in the casualty field, covering automobiles, pleasure boats, and homes. The casualty underwriter analyzes the application of each group member and makes individual appraisals. Some group underwriters attend meetings with union or employer representatives to discuss the types of policies available to their groups.

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 be away from home for several days while attending meetings.

Places of Employment

An estimated 28,000 persons worked as insurance underwriters in 1978. Over three-fourths were property and liability underwriters working in regional or home offices throughout the United States; most life insurance underwriters were in home offices in a few large cities, such as New York, San Francisco, Chicago, Dallas, and Philadelphia.

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 back-

ground. 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 applicants 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 sound judgment that is required, they are assigned policy applications that are more complex and have a greater face value.

Continuing education is a necessity if the underwriter expects to advance to senior level positions. Insurance companies generally place great emphasis on completion of one or more of the recognized independent study programs. Many companies pay tuition and the cost of books for those who satisfactorily complete underwriting courses; some offer salary increases as an additional incentive. 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. As underwriters gain experience, they can qualify as a "fellow" of the Academy of Life Underwriters by passing a series of examinations and completing 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 to analyzing problems, underwriters must make prompt decisions and be able to communicate their ideas effectively. They must also be imaginative and aggressive, especially when they have to get additional 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 after several years.

Employment Outlook

Employment of underwriters is expected to rise faster than 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, a much larger portion of our population will enter their most productive



To assure an accurate appraisal of risk, underwriters carefully review applications.

years. As this traditional market for life insurance expands, the volume of life insurance sales is expected to rise to protect families' standards of living, finance children's education, and provide retirement income. Property and liability insurance sales also should expand as purchases of automobiles, pleasure boats, and other consumer durables increase. Both spending for new home construction and the American public's growing security consciousness should contribute to demand for more extensive insurance protection. New or expanding businesses will need protection for new plants and equipment and insurance for workers' compensation and product liability. Heightened competition among insurance companies and changes in regulations affecting investment profits also are expected to increase the insurance industry's need for competent underwriters.

Earnings

Underwriters in life insurance who had 2 to 4 years' experience averaged about \$14,000 a year in 1978, according to a Life Office Management Association (LOMA) survey. Senior life underwriters (those with 5 to 8 years' experience) averaged \$18,600, while

senior group underwriters earned average salaries of \$18,700. Supervisors of underwriting in life insurance companies averaged \$17,670 to \$23,860. In most cases, underwriters in larger companies earned higher salaries.

A survey of companies that sell property and liability insurance showed that underwriters with 2 to 4 years' experience averaged \$14,800 a year in 1978. Earnings varied substantially by underwriting specialty, however: personal lines underwriters earned average salaries of \$12,800, while those specializing in surety bonds averaged \$15,600. Senior underwriters earned substantially higher incomes—personal lines underwriters averaged \$17,300 while those specializing in commercial lines received an average of \$13,600 a year. Experienced underwriters earn about one and one-half times the average earnings of nonsupervisory workers in private industry, except farming. Underwriting supervisors in property and liability companies averaged about \$19,700 a year in 1978.

Most insurance companies have liberal vacation policies and other employee benefits. (See the statement on the insurance industry

for additional information on working conditions and employee benefits.)

Related Occupations

Underwriters make important 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, 1776 F St. NW., Suite 504, Washington, D.C. 20006.

The National Association of Independent Insurers, Public Relations Department, 2600 River Rd., Des Plaines, Ill. 60018.

Administrative and Related Occupations

Business and other organizations need a diversity of workers to keep things running smoothly. Hotels, for example, need managers to operate the hotel profitably and to see that the needs of guests are satisfied. Large corporations require workers to handle specialized areas such as personnel, public relations, purchasing, and market research. Many communities employ city managers to help solve problems such as air and water pollution, and urban planners to make decisions concerning growth and development. Most organizations also employ the services of accountants and lawyers; larger organizations have these workers on their staff. The decisions and advice of these and other administrative workers combine to set organization goals and policies and determine day-to-day actions.

Nearly all administrative jobs require a college degree, although employers vary in the specific area of study they seek. The jobs also involve different types of skills. Accountants, for example, need to be competent in mathematics because they prepare and analyze financial reports. For other workers, such as college student personnel workers and hotel managers, the ability to deal well with people is more important.

This section describes a number of administrative occupations, including city managers, buyers, lawyers, and purchasing agents.

Accountants

(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 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 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 to judge their compliance with standards of preparation and reporting). Others specialize in tax matters, such as preparing income tax forms and advising clients of the advantages and disadvantages of certain business decisions. They often help develop estate plans that will have high benefits and low taxes. Still others specialize in management consulting and give advice on a variety of matters. They might develop or revise an accounting system to serve the needs of cli-

ents more effectively or give advice about different 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. Accountants who work as internal auditors examine and evaluate their firm's financial systems and management control procedures to ensure efficient and economical 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 educators, they may teach accounting as well as finance, marketing, management, and related fields; some are primarily researchers or administrators. Many 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 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.

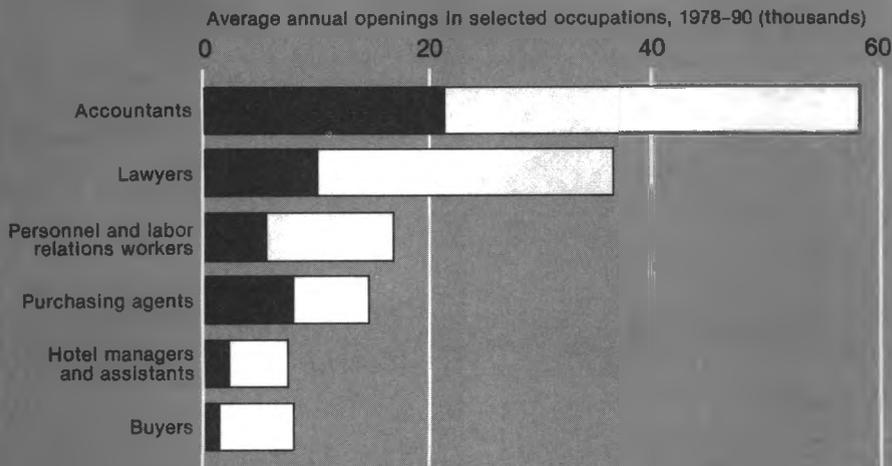
Tax accountants work long hours under heavy pressure during the tax season. Accountants employed by large firms may travel extensively to audit or work for clients or branches of the firm.

Places of Employment

Over 980,000 people worked as accountants in 1978, including over 150,000 Certified Public Accountants (CPA), 17,000 licensed public accountants, and about 9,000 Certified Internal Auditors (CIA).

About 60 percent of all accountants do management accounting. An additional 25 percent 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

Openings vary greatly among administrative and related occupations



Source: Bureau of Labor Statistics

■ Growth □ Deaths and retirements

for part-time work, particularly in smaller firms.

Accountants 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, such as Chicago, Los Angeles, New York, and Washington, D.C.

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, 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 employers 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 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 require at least the master's degree or the Certified Public Accountant Certificate.

Previous experience in accounting 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 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 very 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. 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 a bachelor's degree plus

30 additional semester hours. 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.

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 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 ser-

VICES of accountants, the public expects accountants to have the highest 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. Increasingly, accountants are studying computer programming so they can adapt accounting procedures to data processing. Although capable accountants 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



Accountants must be able to concentrate and work accurately on detailed matters for long periods of time.

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.

Employment 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 of the size of the occupation, however, even more job openings should result from deaths, retirements, and other separations from the labor force than from employment growth.

Demand for skilled accountants 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. Government legislation to monitor business activity also is expected to add to the demand for accountants. Legislation and regulations regarding pension reform, tax reform, revenue sharing, funding of elections, financial disclosure, and other matters should create many jobs for accountants. In addition, increases in investment and lending and the need for government to allocate limited funds also should spur demand for accountants.

College graduates will be in greater demand for accounting jobs than applicants who lack this training. 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 should stimulate the demand for those trained in such procedures.

Earnings

According to a 1978 College Placement Council Salary Survey, bachelor's degree candidates in accounting received offers averaging around \$13,500 a year; master's degree candidates, \$16,000. Public accounting firms offered bachelor's degree candidates around \$14,000 a year.

The starting salary of beginning accountants in private industry was about \$12,800 a year in 1978, according to a national survey.

Earnings of experienced accountants ranged between \$15,700 and \$27,300, depending on 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 \$23,700 and \$39,900, depending upon the scope of their authority and size of professional staff.

According to the same survey, beginning auditors averaged \$13,200 a year in 1978, while experienced auditors' earnings ranged between \$15,700 and \$23,100.

In the Federal Government, the starting salary for junior accountants and auditors was \$10,507 in early 1979. Candidates who had a superior academic record could begin at \$13,014. Applicants with a master's degree or 2 years' professional experience began at \$15,920. Accountants in the Federal Government averaged about \$24,300 a year in early 1979.

According to a 1978 survey of State governments, average annual salaries of beginning accountants or auditors ranged from about \$10,800 to \$14,200; principal auditors (work at first level of full supervision), \$15,900 to \$21,300; accounting supervisors (work at first level of full supervision), \$14,700 to \$19,600; and chief fiscal officers (those who administer accounting and fiscal management programs of large State agencies), \$20,800 to \$27,400.

Related Occupations

Accountants 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 is available from:

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

National Society of Public Accountants, 1717 Pennsylvania Ave. NW., Washington, D.C. 20006.

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, 1755 Massachusetts Ave. NW., Suite 320, Washington, D.C. 20036.

Buyers

(D.O.T. 162.157-018 and -022; 185.167-034)

Nature of the Work

The Americans have been invited to a private showing in Paris. Representing a major New York department store, they sit with a select group in an elegantly furnished room. They watch closely as graceful models float down the runway before them to display the latest creations by the world's most famous designers. After some consultation, they make choices involving thousands, perhaps millions of dollars. 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 involving travel abroad. Not every buyer, however, deals in fashion. All merchandise sold in a retail store—garden furniture, automobile tires, toys, aluminum pots, and canned soups alike—appears in that store on the decision of a buyer. Although all buyers seek to satisfy their stores' customers and sell at a profit, the kind and variety of goods they purchase depend on the store where they work. A buyer for a small clothing store, for example, may purchase its complete stock of merchandise, from sportswear to formal evening clothes. Buyers who work for larger retail businesses often handle one or a few related lines of goods, such as men's wear, ladies' sportswear, or children's toys. Some, known as *foreign buyers*, purchase merchandise outside the United States.

In order to purchase the best selection of goods for their stores, buyers must be familiar with the manufacturers and distributors who handle the merchandise they need. They also must keep informed about changes in existing products and the development of new ones. To learn about merchandise, buyers attend fashion and trade shows and visit manufacturers' showrooms. They usually order goods during buying trips, and also place orders with wholesale and manufacturers' sales workers who 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 are aware of their stores' profit margins and try to select merchandise that will sell quickly at well above the original cost. Since most buyers work within a limited budget, they must plan their purchases to keep needed items always in stock but also allow for unexpected purchases when a "good buy" presents itself.

Because buyers purchase merchandise for their firms to resell (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 a particular line of merchandise, buyers study market research reports and ana-

lyze 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 ads in newspapers and other media to check retail competitors' sales activities; and watch general economic conditions to anticipate consumer buying patterns.

Merchandise managers (D.O.T. 185.167-034) plan and coordinate buying and selling activities for large and medium-sized stores. They divide the budget among buyers, decide how much merchandise to stock, and assign each buyer to purchase certain goods. Merchandise managers may review buying decisions to ensure that needed categories of goods are in stock, and help buyers to set general pricing guidelines.

Buyers and merchandise managers usually have very busy schedules and deal with many different people in the course of a day. They work with manufacturers' representatives, other store personnel including store executives and sales workers, and customers. Assisting with sales promotions and creating enthusiasm among sales personnel are part of the buyer's job, and he or she may be asked to provide information, such as dress sizes and product descriptions, to the advertising department for a sales promotion, or to meet with floor sales workers before a new line of merchandise is introduced. Some buyers direct assistants who handle routine aspects of purchasing such as verifying shipments; others supervise department managers.

Some buyers represent large stores or chains in cities where many manufacturers are located. The duties of these "market representatives" vary by employer; some purchase goods, while others supply information and arrange for store buyers to meet with manufacturers when they are in town.

New technology has altered the buyer's role in retail chainstores. In the past, firms employed a buyer for each store or 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 garden furniture buyer, for example, can purchase lawn chairs and picnic tables for the entire chain.

Working Conditions

Retailing is a highly competitive business, and buyers operate under considerable 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 the

job can provide 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 a buyer does varies with the type of merchandise bought and the location of suppliers, but most spend 4 or 5 days a month on the road.

Places of Employment

In 1978, approximately 115,000 buyers and merchandise managers worked for retail firms. Although jobs for buyers are found in all parts of the country, most jobs are in major metropolitan areas where retail stores are concentrated. Market representatives work for buying offices in major market areas such as New York, Chicago, and Dallas.

Training, Other Qualifications, and Advancement

Because familiarity with the merchandise and with the retailing business itself is such a central element in the buyer's job, prior retailing experience sometimes provides sufficient preparation. Many a successful buyer began in a stockroom or behind a sales counter and worked up the ladder. 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*.)

More and more, however, 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, such training is not essential, as a rule. Most employers accept college graduates in any field of study and train them on the job.

In many stores, beginners who are candidates for buying jobs start out in executive training programs. These programs usually last from 6 to 8 months and 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

The trainee's first job is likely to be that of assistant buyer. The duties include supervising sales workers, checking invoices on material received, and keeping account of stock on hand. Assistant buyers gradually assume purchasing responsibilities, depending upon their individual abilities and the size of the department where they work. Training as an assistant buyer usually lasts at least a year.



Buyers must be able to assess the resale value of goods.

After years of working as a buyer, those who show exceptional ability may advance to merchandise manager. A few find further promotion to top executive jobs such as general merchandise manager for a retail store or chain. The length of time it takes to reach any of these levels depends not just on the individual's ability but on the store's need for management personnel. The faster the company grows, the greater the opportunity for a worker to acquire responsibility.

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 constant pressure of their work, buyers need physical stamina and emotional stability.

Employment Outlook

Employment of buyers is expected to grow about as fast as the average for all occupations through the 1980's. The rate of growth is expected to be slower than that projected for the retail trade industry as a whole, however. This mainly reflects the increased use of computerized systems to maintain inventories and to order standard items of merchandise through centralized buying. Such systems are gaining popularity among chainstores and are expected increasingly to dominate general merchandise retailing. Most job openings will arise each year from the need to replace workers who leave the occupation.

Competition for buying jobs is expected to be keen, for merchandising attracts large numbers of college graduates every year. Prospects are likely to be best for qualified applicants who enjoy the competitive nature of retailing and work best in a demanding, fast-paced job.

Earnings

Buyers for discount department stores and other mass merchandising firms are among the most highly paid in the industry, as are those who buy centrally for large chain department stores. Most earned between \$23,000 and \$32,000 a year in 1978, though many earned salaries outside this range. Merchandising managers earned considerably more. The actual income depends upon the product line purchased, the sales volume of the store, and the individual's seniority.

Buyers often earn large bonuses (cash gifts) for exceptional performance. In addition, many stores have incentive plans, such as profit sharing and stock options.

Related Occupations

Workers in other occupations need a knowledge of marketing and the ability to assess consumer demand; among them are 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, 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 traffic congestion, crime, or urban renewal, 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, re-

ceive 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 ventilated offices. They often work overtime at night and on weekends meeting 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.

Places of Employment

About 3,000 city managers were employed in 1978. In addition, several times as many persons worked as administrative assistants, department head assistants, and assistant city managers. Most city managers worked for cities and counties that had 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 worked for municipalities that had the mayor-council form of government, in which the mayor appoints the city manager as his or her chief administrative officer. A few city managers also worked for county governments, metropolitan or regional planning organizations, and councils of governments. All types of local governments employed management assistants, but larger jurisdictions generally employed them in greater numbers.

Although over three-fourths of all city managers work for small cities having fewer than 25,000 inhabitants, many larger cities also employ a city manager. About one-half of the cities having a population of between 10,000 and 500,000 have city managers.

Training, Other Qualifications, and Advancement

A master's degree, preferably in public or business administration, is becoming essential for those seeking a career in city manage-



City manager and management assistant prepare to brief the city council on the proposed city budget.

ment. Although some applicants with only a bachelor's degree may find employment, strong competition for positions, even among master's degree recipients, will make the graduate degree a requirement for most entry level jobs. In some cases, employers may hire a person with a graduate degree in a field related to public administration, such as engineering, social work, political science or law.

In 1978, 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. 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.

Employment Outlook

Employment of city managers and local government management assistants is expected to expand faster than the average for all occupations through the 1980's as management of our governments becomes more 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 should result in additional job opportunities for city managers and management assistants in councils of government.

Persons who seek beginning management assistant jobs are expected to face keen competition through the 1980's. 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. However, many of those unable to find employment as management assistants or city

managers should find jobs in other fields of public administration.

Earnings

Salaries of city managers and management assistants vary according to experience, job responsibility, and city size. In 1978, the average annual salary for all managers was more than \$26,000, about two and one-half times the average earnings for all nonsupervisory workers in private industry, except farming. In 1978, average annual salaries of city managers ranged from about \$22,000 in small cities of 5,000 to 10,000 inhabitants to about \$40,000 in medium-sized cities of 50,000 to 100,000 inhabitants, according to the International City Management Association. City managers employed in large cities earned salaries of more than \$50,000 a year. City managers in cities not having council-manager governments received slightly less.

Salaries of management assistants ranged from about \$12,000 in small cities to more than \$20,000 in large ones. Salaries of assistant city managers generally were higher than those of other management assistants.

City managers often work more than 40 hours a week. Emergencies may require evening and weekend work and meetings with individuals and citizen's groups consume additional time.

Related Occupations

A variety of related careers are open to persons interested in managerial work. In the private sector, a wide range of managerial and executive careers are possible in business and industry. 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 on a career in city management, contact:

International City Management Association, 1140 Connecticut Ave. NW., Washington, D.C. 20036.

College Student Personnel Workers

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

Nature of the Work

A student's choice of a particular institution of higher education is influenced by many factors. Availability of a specific educational program, quality of the school, cost, and location all may play important roles.

For many students, however, an equally 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 admissions officer, the registrar, the dean of students, and the career planning and placement counselor are probably the best known among these. Other workers who make up this broad occupational field include student activities and college union personnel, student housing officers, counselors in the college counseling center, financial aid officers, and foreign student advisers.

Titles of student personnel workers 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 include dean, director, officer, associate dean, assistant director, and counselor.

The *dean of students*, or the vice president for student affairs, heads the student personnel program at a school. Among his or her duties are evaluating the changing needs of the students and helping the president of the college develop institutional policies. For example, to meet the needs of an increasing number of older, part-time students, colleges and universities have been changing their policies concerning areas such as student housing and student participation in decisions on graduation requirements and course offerings. In addition, the dean of students generally coordinates a staff of associate or assistant deans who are in charge of specific programs that deal directly with the students.

Admissions counselors interview and evaluate prospective students and process their applications. They may travel extensively to recruit high school, junior college, and older students and to acquaint them with opportunities available at their college. They work closely with faculty, administrators, financial aid personnel, and public relations staffs to determine policies for recruiting and admitting students.

Personnel in the office of the *registrar* maintain the academic records of students and provide current enrollment statistics to those who require them both within the college and in the community.

Student financial aid personnel help students obtain financial support for their education. Workers in this field must keep well informed about the sources and management of all forms of financial aid—scholarships, grants, loans, employment, fellowships, and teaching and research assistantships. They work closely with administrators and the admissions, counseling, business, and academic office staffs.

Career planning and placement counselors, sometimes called college placement officers, assist students in career selections and also may help them get part-time and summer jobs. On many campuses, they arrange for prospective employers to visit the school to discuss their personnel needs and to interview applicants. For further information on



Financial aid personnel must be well informed about all sources of financial aid.

this field, see the chapter on college career planning and placement counselors.

The student personnel staff in charge of *student activities* work with members of proposed and established student organizations, especially with student government. They help the student groups to plan, implement, and evaluate their activities. Often, the student activities staff will assist in the orientation of new students.

College union staff members work with students to provide intellectual, cultural, and recreational programs. Many college union staff members direct the operation of the physical facilities and services of the college union building, such as food and recreational services, building maintenance, fiscal planning, and conference facilities.

Student housing officers sometimes live in the dormitories and, in general, help the students to live together in harmony. They may serve as counselors to individual students with personal problems. Housing officers also may be involved in managing the fiscal, food service, and housekeeping operations of student residences.

Counselors help students with personal, educational, and vocational problems. Students may come to the counselors 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. In addition, there is a growing trend for counselors to try to reach more students by establishing group sensitivity sessions and telephone "hotlines." Counselors often administer tests that indicate aptitudes and interests to stu-

dents having trouble understanding themselves. Some also teach in the college or assist with admissions, orientation, and training of residence hall staff. For further information on this field, see the chapter on psychologists that appears elsewhere in the *Handbook*.

Foreign student advisers administer and coordinate many of the services that help to insure a successful academic and social experience for students from other countries. They usually assist with foreign student 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 an adviser for international associations and nationality groups and for U.S. students interested in study, educational travel, work, or service projects abroad.

Working Conditions

Students are not always available for consultation or meetings during the day, so evening and weekend work is common. And since the workflow at a college may be irregular, college student personnel workers 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 at private institutions may work long hours in early spring, as the deadline for determining next year's student body approaches.

Places of Employment

An estimated 55,000 college student personnel workers were employed in 1978. Every college and university, whether a 2-year or a 4-year school, has a staff performing student personnel functions. They are not al-

ways 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. Generally, however, a master's degree is preferred and a doctoral degree may be necessary for advancement to top-level positions. 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 work. In 1978, over 100 colleges and universities offered graduate programs in this area.

Other specialized training also may be required for some student personnel occupations. A master's degree in clinical or counseling psychology usually is required for work as a college counselor. This degree also is helpful in other student personnel fields such as career planning and placement. Familiarity with data processing is an asset, especially for work in admissions, records, or financial aid.

Previous experience in college administration is desirable. Many graduate students obtain this 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.

College student personnel workers must be interested in, and able to work with, people of all backgrounds and ages. They must have the patience to cope with conflicting viewpoints of students, faculty, and parents. People in this field often deal with the unexpected and the unusual; therefore, emotional stability and the ability to function while under pressure are necessities.

Entry level positions usually are those of student activities advisers, admissions counselors, financial aid counselors, residence hall directors, and assistants to deans. Persons who do not have graduate degrees may find advancement opportunities limited. A doctorate usually is necessary for the top student personnel positions.

Employment Outlook

The employment outlook for college student personnel workers is likely to be somewhat competitive through the 1980's. Tightening budgets in both public and private colleges and universities are expected to limit growth in employment. Student personnel positions least likely to be affected if some reduction becomes necessary are those in admissions and financial aid. Most openings will result from the need to replace personnel who transfer to other positions, retire, or leave the field for other reasons.

Any employment growth that does occur is expected to be in junior and community colleges. Enrollment at this level of education has been rising and many new schools have opened. If this trend continues, some additional student personnel workers will be needed in 2-year institutions.

Earnings

In 1978, annual salaries averaged \$37,800 for presidents and chancellors, \$28,100 for deans, \$20,600 for counseling directors, \$20,300 for admissions directors, \$18,000 for registrars, \$17,900 for placement directors, \$16,800 for financial aid directors, and \$16,700 for housing directors, according to a survey by the National Center for Education Statistics. Salaries vary greatly, however, depending on geographic location and the size of the school.

Employment in these occupations usually is on a 12-month basis. In many schools, college student personnel workers are entitled to retirement, group medical and life insurance, and sabbatical and other benefits.

Related Occupations

Secondary and elementary schools also need a variety of administrative workers to operate effectively. Included in this group are superintendents, principals, deans, guidance counselors, and school psychologists.

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 extensively to buy houses, cars, refrigerators, and many other goods and services. The vast majority of business purchases, such as raw materials used in manufacturing and merchandise to be sold in retail stores, also are bought on credit so that businesses do not have to tie up their cash in inventories.

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, credit bureaus, and banks to provide information about the person applying for credit.

Particularly in large organizations, execu-

tive 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 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, and secretaries.

In small companies that handle a limited number of accounts, credit managers may do much of the work of granting credit themselves. They may interview applicants, analyze the information gained in the interview, and make the final approval. They frequently must contact customers who are unable or refuse to pay their debts. They do this through writing, telephoning, or personal contact. 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 35-40 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.

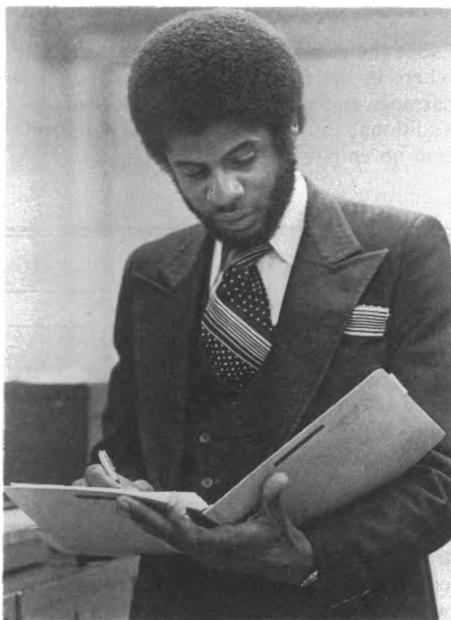
Places of Employment

About 49,000 persons worked as credit managers in 1978. About one-half were employed in wholesale and retail trade, but many others, about 40 percent of the total, 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



Credit managers must be able to analyze detailed information in order to make a sound decision on granting credit.

valuable in preparing for a career in credit management. Some employers may promote high school graduates to credit manager positions if they have experience in credit collection or processing credit information.

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

Many formal training programs are available through the educational branches of the associations that service the credit and finance field. This training includes home study, college and university programs, and special instruction to improve beginners' skills and keep experienced credit managers aware of new developments in their field.

A person interested in a career as a credit manager 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. However, in small and medium-sized companies, such opportunities are limited.

Employment Outlook

Employment of credit managers is expected to grow more slowly than the average for all occupations through the 1980's. Despite this relatively slow growth, many jobs will become available each year due to the need to replace persons who leave the occupation. Although there will be opportunities throughout the country, employment prospects should continue to be best for well-qualified jobseekers in metropolitan areas.

The volume of credit extended rose very rapidly during the past decade. In the years ahead, businesses can be expected to require increasing amounts of credit to secure raw materials for production and obtain finished goods for eventual resale. It is in the area of business credit where demand for credit managers will be strongest.

Consumers, whose personal incomes have risen, are expected to finance greater numbers of high-priced items. In addition, the use of credit for everyday purchases is expected to grow as demand increases for recreation and household goods as well as for consumer services. Despite increases in consumer debt, the use of computers for storing and retrieving information will enable this greater volume of information to be processed more efficiently. The use of telecommunications networks enables retail outlets to have immediate access to a central credit office, regardless of distance.

Another factor that is expected to slow the growth in the number of credit managers is the increased use of bank credit cards for consumer purchases. As stores substitute bank credit cards for their own charge accounts, retail store credit departments may be reduced or eliminated.

Earnings

In 1978, credit manager trainees who had a college degree earned annual salaries that ranged from about \$11,000 to \$12,000, depending on the type of employer and the geographic location of the job.

Assistant credit managers averaged about \$13,000 to \$16,000 a year and credit managers had average earnings of about \$20,000. Individuals in top-level positions often earn over \$40,000 a year.

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, controllers, financial institution managers, letter of credit negotiators, and dealer accounts credit officers.

Sources of Additional Information

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

International Consumer Credit Association, 243 North Lindbergh Blvd., St Louis, Mo. 63141.

National Consumer Finance Association, 1000 16th St. NW., Washington, D.C. 20036.

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

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

Hotel Managers and Assistants

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

Nature of the Work

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

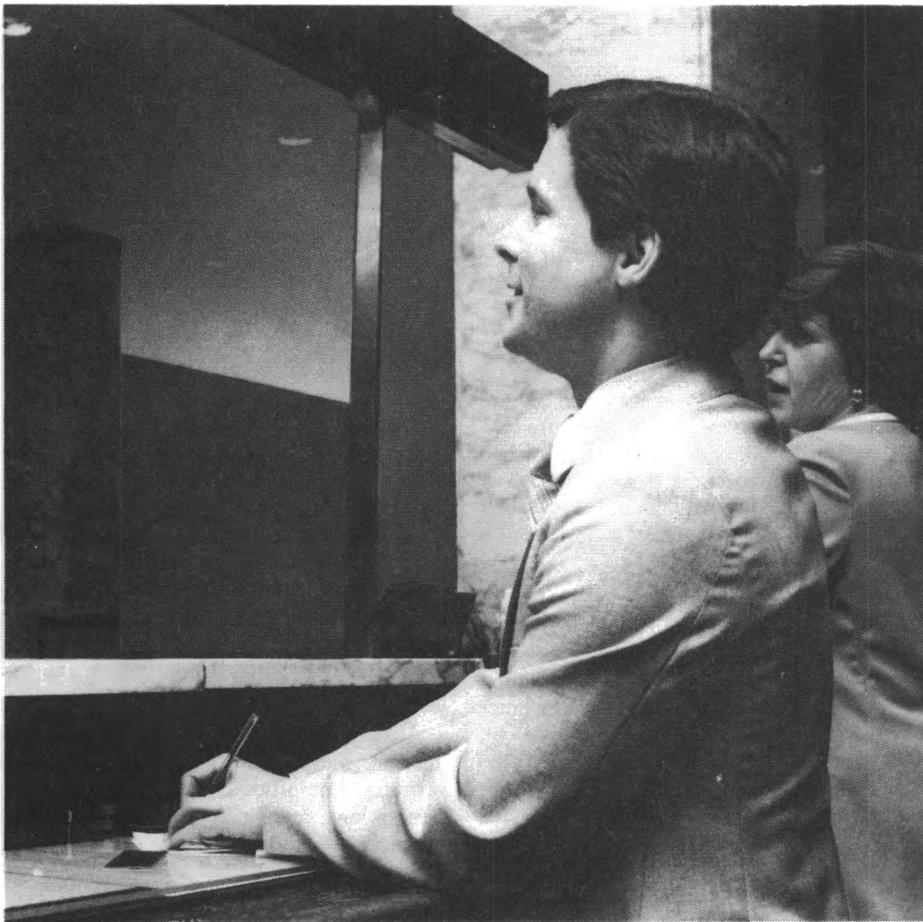
General managers of large hotels usually have several assistants or department heads who manage various parts of the operation. Because the hotel restaurant and cocktail lounge are important to the success of the entire establishment, they almost always are operated by managers with experience in the 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 168,000 hotel and motel managers worked in 1978. More than a third were self-employed.

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 1979, about 50 colleges and universities offered 4-year programs in this field. Applicants to these programs may face increasing competition in the



In small hotels, managers may have to fulfill various front office duties.

coming years, however. Many junior colleges, technical institutes, and the Educational Institute of the American Hotel & 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 seeking 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 outstanding employees in acquiring the necessary training in hotel management.

Most hotels promote employees who have proven their ability, usually front office clerks, to assistant manager and eventually to general manager. Newly built hotels, particu-

larly 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 independent properties, because employees can transfer to another hotel or motel in the chain or to the central office if an opening occurs.

Employment Outlook

Employment of hotel managers is expected to grow more slowly than the average for all occupations through the 1980's. Some job openings will occur 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. Applicants who have college degrees in hotel administration will have an advantage in seeking entry positions and later advancement.

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 managers, food service managers, department managers, office managers, and sales managers.

Sources of Additional Information

See the chapter on the hotel industry elsewhere in the *Handbook* for information on earnings and working conditions, sources of additional information, and more information on employment outlook.

Lawyers

(D.O.T. 110 and 090.227-010)

● Laws permeate 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 human 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 change. Keeping the law responsive to human needs is the work of lawyers. Also called attorneys, lawyers 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

Certain activities are common to nearly every attorney's work. Probably the most fundamental is interpretation of the law. Every attorney, whether representing the defendant in a murder trial or the plaintiff (suing party) in a lawsuit, combines an understanding of the relevant laws with knowledge of the facts in the case to determine how the first affects the second. Based on this determination, the attorney decides what action would best serve the interests of the client.

To interpret the law, lawyers do research. They must stay abreast of their field, in both legal and nonlegal matters. An attorney representing electronics manufacturers, for example, must follow trade journals and the latest Federal regulations affecting his or her clients. 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.



Painstaking research is an integral part of a trial attorney's job.

A lawyer consults with clients to determine the details of problems, advise them of the law, and suggest action that might be taken. To be effective, a lawyer must deal with people in a courteous, efficient manner and not disclose personal matters. Lawyers serve as models for conduct and their practice is governed by strict rules of ethics.

Finally, most lawyers write reports or briefs which must be communicated clearly and precisely. The more detailed aspects of a lawyer's job depend upon his or her field and position.

A significant number specialize in one branch of law, such as corporate, criminal, labor, patent, real estate, tax, 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.

Other lawyers representing public utilities before the Federal Power Commission (FPC) 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. A small number of lawyers work entirely in the courtroom. 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 specialize in one or more subjects, while others serve as administrators. Some work full time in nonaca-

demie settings and teach part time. (For additional information, see the *Handbook* statement on college and university faculty.)

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 to 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 prison cells. 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, on the other hand, whose schedules are more flexible, 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.

Places of Employment

Over 480,000 persons worked as lawyers in 1978. About 70 percent of them practiced privately. Many worked in law firms; others had solo practices. Most of the remaining 30 percent held positions in Federal, State, and local government. Others were 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. About 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 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.

Although there is no nationwide bar exam, 43 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, an increasing number 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 1977 about one-seventh of all graduates of ABA-approved schools were part-time students.

Competition for admission to law school has become intense in recent years. Enrollments have risen very rapidly, with applicants outnumbering available seats by about 2 to 1. Competition is even stiffer in more prestigious law schools. Although the increase in enrollments may slow 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 such thing as a "prelaw major," the undergraduate program almost always makes a difference. 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, as long as the student does not specialize too narrowly. Regardless of one's major, English, foreign language (particularly Latin), 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 1978, the American Bar Association approved 167 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 where 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 in "lawyering" 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 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 study is 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.

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.

Most beginning lawyers start in salaried positions. Newly hired salaried attorneys usually act as research assistants (law clerks) 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.

Employment 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. Employment growth also will be spurred by Supreme Court decisions extending the right to counsel for all persons accused of crimes, an increase in publicly funded legal services for low-income persons, 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 very strong employment growth in this occupation, 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, and as law clerks for judges. Graduates of less prominent schools and those with lower scholastic ratings will experience some difficulty in finding salaried jobs. 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.

With increasing competition for jobs, a law graduate's geographic mobility and experience assume greater importance. The willingness and ability to relocate may be an advan-

tage in getting a job. In addition, employers increasingly seek graduates who have training 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 agencies, law firms, and big corporations are concentrated.

Earnings

Starting salaries offered to 1978 law school graduates varied from a low of \$8,000 a year offered by small firms to a high of \$29,000 offered by a large corporation. Beginning attorneys in private industry averaged around \$18,000. In the Federal Government, annual starting salaries for attorneys in early 1979 were \$15,920 or \$19,263, 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 1978 was over \$50,000. The median annual salary of nonsupervisory lawyers employed by business corporations in 1977 exceeded \$31,000, while some heads of law departments earned over \$70,000. General attorneys in the Federal Government averaged around \$30,400 a year in 1978; the relatively small number of patent attorneys averaged around \$37,400. Although lawyers are concentrated in the Departments of Justice, Defense, and Treasury, significant numbers work in many other Federal agencies.

Lawyers starting their own practice may need to work part time in other occupations during the first years. Lawyers on salary receive increases as they assume greater responsibility. Incomes of lawyers in private 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:

American Bar Association, Information Services, 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, 3200 Fifth Avenue, Sacramento, California 95817.

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.

Marketing Research Workers

(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. Marketing research workers analyze the buying pub-

lic and its wants and needs, thus providing the information on which these marketing decisions can be based.

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? Is the price 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, marketing research workers determine what actions should be taken. They may conclude, for example, that sales would improve substantially with an increased newspaper advertising campaign, or perhaps that the company should pull out completely and 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 workers often are concerned with finding out customers' opinions and tastes. 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 and satisfied with the price.

Marketing 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 in depth reliable information. Trained interviewers then conduct the survey, and office workers tabulate the results under the direction of marketing research workers.

In contrast to surveys for consumer goods, researchers for business and industrial firms often conduct the interviews themselves to gather opinions of the products. 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

Marketing research workers usually work in modern, centrally located offices. Some, especially those employed by independent research firms, may travel for their work. Also, they may have to work long hours, including nights and weekends, when working to meet deadlines.



Marketing research workers use all kinds of media to determine customer preference.

Places of Employment

About 24,000 full-time marketing research workers were employed in 1978. Most jobs for marketing research workers 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. Marketing research organizations range in size from one-person enterprises to firms with a hundred employees or more.

A large number of marketing research workers are employed in New York City where major advertising agencies, independent marketing organizations, and central offices of large manufacturers are located. Chicago has another large concentration.

However, marketing research workers are employed in many other 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 marketing research. Graduate study usually is required for advancement, and a sizable number of market researchers have a master's degree in business administration or other graduate degree in addition to a bachelor's degree in marketing. 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 depart-

ments in business firms or advertising agencies.

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 marketing research. Some marketing research positions require specialized skills such as engineering, or substantial sales experience and a thorough knowledge of the company's products. Knowledge of data processing is helpful for sales forecasting, distribution, and cost analysis.

College graduates may find their first job in any of a number of places: The market research department of a large company, a research firm, an advertising agency, 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 gain experience, assistants and junior analysts may assume responsibility for specific marketing research projects, or advance to supervisory positions. An exceptionally able worker may become marketing research director or vice president for marketing or sales.

Either alone or as part of a team, marketing research workers must be able to analyze problems objectively and apply various techniques to their solution. As advisers to management, they should be able to write clear reports informing company officials of their findings.

Employment Outlook

Opportunities should be best for applicants with graduate training in marketing research or statistics. The growing complexity of marketing research techniques also may expand opportunities in this field for psychologists, economists, and other social scientists.

Marketing 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. As a result, employment of marketing research workers is expected to grow much faster than the average for all occupations through the 1980's.

Competition among manufacturers of both consumer and industrial products will make the appraising of marketing situations increasingly important. As techniques improve

and statistical data accumulate, company officials are likely to turn more often to marketing research workers for information and advice.

Earnings

Salaries of beginning marketing researchers were about \$14,000 a year in 1978, according to the limited information available. Persons with master's degrees in business administration and related fields usually started with salaries of about \$18,000 a year. Starting salaries varied according to the type, size, and location of the firm as well as the exact nature of the position. Generally, though, starting salaries were somewhat higher but promotion somewhat slower than in other occupations requiring similar training.

Experienced workers such as senior analysts received salaries of over \$24,000 a year. Earnings were highest, however, for workers in management positions of great responsibility. Directors of marketing research earned well over \$35,000 a year in 1978.

Related Occupations

Besides marketing research workers, 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 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, 222 South Riverside Plaza, Chicago, Ill. 60606.

Personnel and Labor Relations Workers

(D.O.T. 166 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. Today, many enterprises have become too large to permit close contact between management and employees. Instead, personnel and labor relations workers 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 with others. Dealing with people is an essential part of the job.

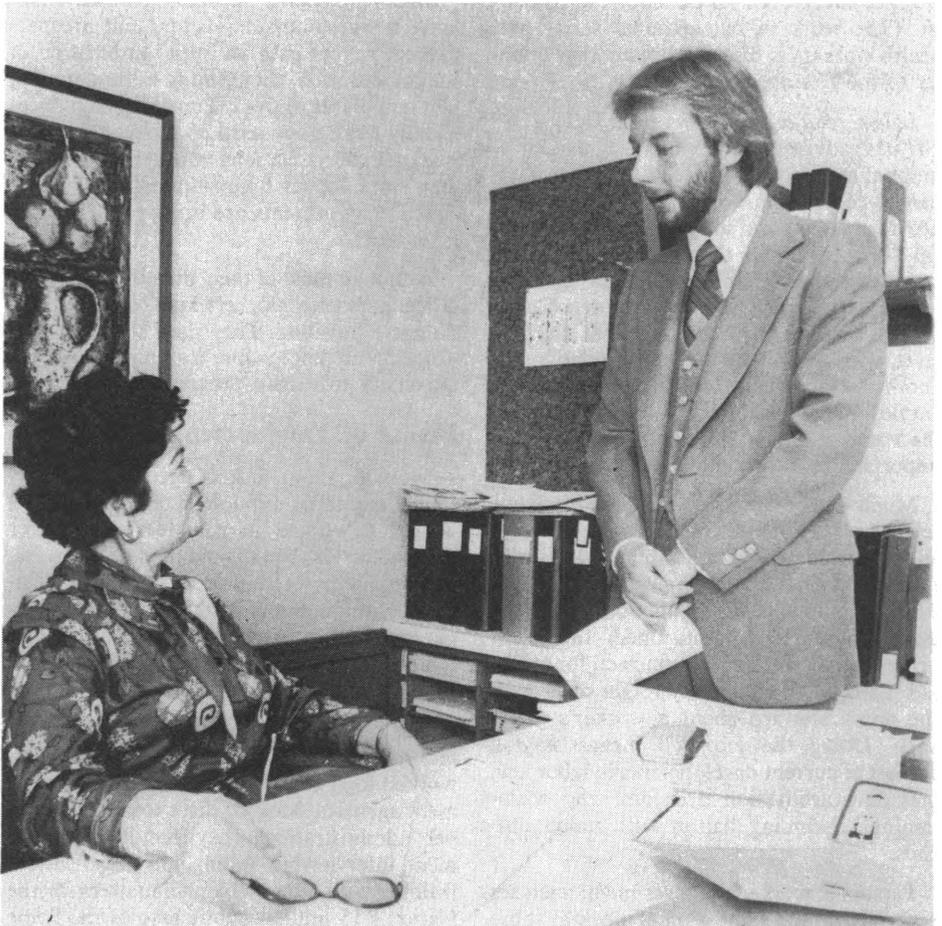
workers concentrate on different aspects of employer-employee relations. Personnel workers interview, select, and recommend applicants to fill job openings. They handle wage and salary administration, training and career development, and employee benefits. "Labor relations" usually means union-management relations, and people who specialize in this field work mostly in unionized businesses and government agencies. They help officials prepare for collective bargaining sessions, participate in contract negotiations with the union, and handle labor relations matters that come up every day.

In a small company, personnel work consists mostly of interviewing and hiring, and one person usually can handle it all. By contrast, a large organization needs an entire staff, which might include recruiters, interviewers, counselors, job analysts, wage and salary analysts, education and training specialists, and labor relations specialists, as well as technical and clerical workers.

Personnel work often begins with the *personnel recruiter* or *employment interviewer* (D.O.T. 166.267-010), who travels around the country, often to college campuses, in the search for promising job applicants. These workers talk to applicants, and select and recommend those who appear qualified to fill vacancies. They often administer tests to applicants and interpret the results. Hiring and placement specialists 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. Special EEO counselors or coordinators handle this complex and sensitive area in some large organizations. The work of employment counselors, which is similar in a number of ways, is described in a separate chapter of the *Handbook*.

Job analysts (D.O.T. 166.067-010) and *salary and wage administrators* (D.O.T. 166.-167-022) do very exacting work. Job analysts collect and examine detailed information on jobs, including job qualifications and worker characteristics, in order to prepare job descriptions. These descriptions, sometimes called position classifications, explain the duties, training, and skills each job requires. Whenever a government agency or large business firm introduces a new job or evaluates existing ones, it calls upon the expert knowledge of the job analyst. Accurate information about job duties also is required when a firm evaluates its pay system and considers changes in wages and salaries. Establishing and maintaining pay systems is the principal job of wage administrators. They devise ways to ensure that pay rates within the firm are fair and equitable, and conduct surveys to see



Personnel workers interview and select applicants to fill job openings.

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.

Training specialists supervise or conduct training sessions, prepare manuals and other materials for these courses, and look into new methods of training. They also counsel employees on training opportunities, which may include on-the-job, apprentice, supervisory, or management training.

Employee-benefits supervisors and other personnel specialists handle the employer's benefits program, which often includes health insurance, life insurance, disability insurance, and pension plans. These workers also coordinate a wide range of employee services, including cafeterias and snack bars, health rooms, recreational facilities, newsletters and communications, and counseling for work-related personal problems. Counseling employees who are approaching retirement age is a particularly 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 in another chapter of the *Handbook*.)

Labor relations specialists (D.O.T. 166-167-034) advise management on all aspects of union-management relations. When a company's contract is up for negotiation, they provide background information and technical support, a job that requires extensive knowledge of economics, 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 everyday work of the labor relations staff concerns interpretation and administration of the contract, the grievance procedures in particular. Members of the labor relations staff might work with the union on seniority rights under the layoff procedure set forth in the contract, for example. Later in the day, they might meet with the union steward about a worker's 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 workers in government agencies generally do the same kind of work as those in large business firms. There are some differences, however. Public personnel workers

deal with employees whose jobs are governed by civil service regulations. Civil service jobs are strictly classified as to duties, training, and pay. This requires a great deal of emphasis on job analysis and wage and salary classification; many people in public personnel work spend their time classifying and evaluating jobs, or devising, administering, and scoring competitive examinations given to job applicants.

Knowledge of rules and regulations pertaining to affirmative action and equal opportunity programs is important in public personnel work. In 1972, the U.S. Civil Service Commission—now the Office of Personnel Management—established a specialization for Federal personnel workers concerned with promoting equal opportunity in hiring, training, and advancement. Similar emphasis is evident in State and local government agencies.

Labor relations is an increasingly important specialty in public personnel administration. Labor relations in this field have changed considerably in recent years, 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 employees usually work a standard 35 to 40 hour workweek. Labor relations workers, however, may work longer hours—particularly when contract agreements are being prepared and negotiated.

Although most of their time is spent in the office, personnel workers may be required to do some traveling. They may attend professional conferences, for example, or visit a university to recruit prospective employees.

Places of Employment

In 1978, about 405,000 people were personnel and labor relations workers. Nearly 3 out of 4 worked in private industry, for manufacturers, banks, insurance companies, airlines, department stores, and other business concerns. Some worked for private employment agencies, including executive job-search agencies, "office temporaries" agencies, and others.

A large number of personnel and labor relations workers, over 100,000 in 1978, worked for Federal, State, and local government agencies. Most of these were in personnel administration; they handled recruitment, interviewing, testing, job classification, training, and other personnel matters for the Nation's 15 million public employees. Some were on the staff of the U.S. Employment Service and State employment agencies. Still

others worked for agencies that oversee compliance with labor laws. Some, for example, were wage-hour compliance officers; their work is described in another part of the *Handbook*, in the section on health and regulatory inspectors (Government). Other public employees in this field carried out research in economics, labor law, personnel practices, and related subjects, and sought new ways of ensuring that workers' rights under the law are understood and protected.

Compared with private industry, labor unions employ few professionally trained labor relations workers. 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 a degree in industrial and labor relations, economics, or law.

A few personnel and labor relations workers are in business for themselves as management consultants or labor-management relations experts. In addition, some teach college or university courses in personnel administration, industrial relations, and related subjects.

Most jobs for personnel and labor relations workers are located in the highly industrialized sections of the country.

Training, Other Qualifications, and Advancement

Most beginning positions in personnel and labor relations are filled by with college graduates. Some employers look for graduates 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 the best preparation. A college major in personnel administration, political science, or public administration can be an asset in looking for a job with a government agency.

Approximately 200 colleges and universities offer undergraduate courses in personnel or labor relations. In addition, 30 schools offer a master's degree in labor or industrial relations. (While personnel administration is widely taught, the number of programs that focus primarily on labor relations is quite small.) In addition, many schools offer course work in closely related fields. An interdisciplinary background is appropriate for work in this area, and a combination of courses in the social sciences, behavioral sciences, business, and economics is useful.

Prospective personnel workers might include courses in personnel management, 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 valuable background for the prospective labor relations worker.

Graduate study in industrial or labor rela-

tions is often required for work in labor relations. Although a law degree seldom is required for entry level jobs, most of the people who are responsible for contract negotiations are lawyers, and a combination of industrial relations courses and a law degree is becoming highly desirable.

A college education, though highly important, is not the only way to enter personnel work. Some clerks advance to professional positions through experience. However, part-time college courses are useful.

New personnel workers usually enter formal or on-the-job training programs to learn how to classify jobs, interview applicants, or administer employee benefits. Next, new workers are assigned to specific areas in the employee relations department, to gain experience. Later, they may advance within their own company, transfer to another employer, or move from personnel to labor relations work.

A growing number of people enter the labor relations field directly, as trainees. They usually are graduates of master's degree programs in industrial relations, or may have a law degree. Quite a few people, however, begin in personnel work, gain experience in that area, and subsequently move into a labor relations job.

Workers in the middle ranks of a large organization often transfer to a top job in a smaller one. Employees with exceptional ability may be promoted to executive positions, such as director of personnel or director of labor relations.

Personnel and labor relations workers 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.

Employment Outlook

The number of personnel and labor relations workers is expected to grow faster than the average for all occupations through the 1980's, as employers, increasingly aware of the benefits to be derived from good labor-management relations, continue to support

sound, capably staffed employee relations programs. In addition to new jobs created by growth of the occupation, many openings will occur as workers die, retire, or leave their jobs for other reasons.

Legislation setting standards for employment practices in areas of occupational safety and health, equal employment opportunity, and pensions has stimulated demand for personnel and labor relations workers. Continued growth is foreseen, as employers throughout the country review existing programs in each of these areas and, in many cases, establish entirely new ones. This has created job opportunities for people who have appropriate expertise. The effort to end discriminatory employment practices, for example, has led to scrutiny of the testing, selection, placement, and promotion procedures in many companies and government agencies. The findings are causing a number of employers to modify these procedures, and to take steps to raise the level of professionalism in their personnel departments.

Substantial employment growth is foreseen in public personnel administration. Opportunities probably will be best in State and local government. By contrast, Federal employment will grow slowly. Moreover, as union strength among public employees continues to grow, State and local agencies will need many more workers qualified to deal with labor relations. Enactment of collective bargaining legislation for State and local government employees could greatly stimulate demand for labor relations workers knowledgeable about public sector negotiations.

Although the number of jobs in both personnel and labor relations is projected to increase over the next decade, competition for these jobs also is increasing. 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

Beginning job analysts in private industry started at about \$12,000 a year in 1978, according to a Bureau of Labor Statistics survey. Experienced job analysts earned \$22,600, about twice the average for all

nonsupervisory workers in private industry, except farming. Wage and salary administrators earned about \$22,100 and personnel managers averaged \$23,600, according to a survey conducted by the Administrative Management Society. Top personnel and labor relations executives in large corporations earned considerably more.

Average salaries for personnel specialists employed by State governments ranged from \$11,000 to \$14,500 a year in 1978, according to a survey conducted by the U.S. Office of Personnel Management. Personnel specialists who had supervisory responsibilities averaged from \$16,200 to \$21,600 and State directors of personnel earned average salaries ranging from \$31,000 to \$36,000.

In the Federal Government, new graduates with a bachelor's degree generally started at about \$10,000 a year in 1978. Those with a master's degree started at about \$15,300. Average salaries of Federal employees in several different areas of personnel and labor relations work ranged from about \$21,400 to \$33,800 in 1978, as shown in the accompanying table.

Related Occupations

All of the personnel and labor relations occupations are, of course, closely related to each other. 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 in other chapters of the *Handbook*.

Sources of Additional Information

For general information on careers in personnel and labor relations work, write to: American Society for Personnel Administration, 30 Park Dr., Berea, Ohio 44017.

For information concerning a career in employee training and development, contact: American Society for Training and Development, P.O. Box 5307, Madison, Wis. 53705.

A brochure describing a career in labor-management relations as a field examiner is available from:

Director of Personnel, National Labor Relations Board, 1717 Pennsylvania Ave. NW., Washington, D.C., 20570.

Table 1. Average salaries of Federal personnel and labor relations workers in selected specialties, 1978

| Specialty | Annual salary |
|---|---------------|
| Mediator | \$33,892 |
| Personnel management specialist | 24,174 |
| Employee development specialist | 23,796 |
| Position classifier | 22,777 |
| Occupational analyst | 22,578 |
| Salary and wage administrator | 21,843 |
| Staffing specialist | 21,447 |

SOURCE: U.S. Office of Personnel Management.

Purchasing Agents

(D.O.T. 162.157-038)

Nature of the Work

If materials, supplies, or equipment are not on hand when they are needed, the entire production process or work flow in an organization could be interrupted or halted.

Maintaining an adequate supply of necessary items is the purchasing agent's responsibility. This includes more than just buying goods and services, however. Market forecasting, production planning, and inventory control all are a part of the job.

Purchasing agents, also called industrial buyers, obtain goods and services of the quality required at the lowest possible cost, and see that adequate supplies always are available. Agents who work for manufacturing firms buy machinery, raw materials, product components, services, and maintenance and repair supplies; those working for government agencies purchase office supplies, furniture, business machines, and vehicles. Information on retail buyers, who purchase merchandise for resale in its original form, is presented in the chapter on buyers elsewhere in the *Handbook*.

Purchasing agents buy supplies when the stocks on hand reach a predetermined reorder point, or when a department in the organization requisitions items it needs. Because agents often can purchase from many sources, their main job is selecting the seller who offers the best value.

Purchasing agents use a variety of means to select among suppliers. They compare listings in catalogs and trade journals and telephone suppliers to get information. They also meet with salespersons to examine samples, attend demonstrations of equipment, and discuss items to be purchased. Frequently, agents invite suppliers to bid on large orders, and then select the lowest bidder among those who meet the organization's requirements for quality of goods and delivery date. New products are researched through trade journals, catalogs, and discussions with suppliers.

Sometimes purchasing agents must deal directly with a manufacturer to obtain specially designed items made exclusively for their organization. To insure that all product specifications are met, agents must have a thorough understanding of the particular product and its applications. In some cases, such as when buying computer equipment, this means agents must have considerable technical knowledge.

It is important that purchasing agents develop a good business relationship with their suppliers as this can result in cost savings, favorable payment terms, and quick delivery on emergency orders or help in obtaining materials in short supply. Agents also work closely with other employees in various departments of their own organization. For example, they may discuss product design with company engineers or shipment problems with workers in the traffic department.

Once an order has been placed with a supplier, the purchasing agent checks periodically to insure prompt delivery. When an order arrives, it is inspected before the purchasing agent authorizes payment to the supplier.

Because of its importance, purchasing usu-



Because purchasing agents can buy from many sources, their main job is to choose the supplier who offers the best value.

ally is designated as a separate responsibility within an organization. In a large firm or government agency, purchasing agents usually specialize in one or more specific commodities or groups of commodities—for example, steel, lumber, cotton, or petroleum products. Agents are divided into sections, headed by assistant purchasing managers, that are responsible for a group of related commodities. In smaller organizations, agents generally are assigned certain categories of goods, such as all raw materials or all office supplies, furniture, and business machines.

Working Conditions

Purchasing agents generally work a standard 35 to 40 hour week. Some overtime may be necessary, for example, if the supply of materials or equipment needed to maintain the production schedule runs short. Although they spend most of their time in the office, some travel usually is required to attend educational seminars and sales conventions, or to visit suppliers.

Places of Employment

About 185,000 persons worked as purchasing agents in 1978. 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 buyers or more.

Training, Other Qualifications, and Advancement

Although there are no universal educational requirements for entry level jobs, most large organizations now require a college degree, and prefer applicants who have a master's degree in business administration or management. Training requirements vary with the needs of the firm. For example, companies that manufacture complex machinery or chemicals may prefer applicants whose backgrounds are in engineering or science, while other companies hire persons who have majored in business administration or a technical discipline for trainee jobs. Courses in purchasing, accounting, economics, and statistics are very helpful. Familiarity with the computer and its uses also is desirable in understanding the systems aspects of the purchasing job.

Small companies generally have less rigid educational requirements because they often purchase less complex goods and order much smaller quantities. Some require a bachelor's

degree; many others, however, hire graduates of associate degree programs in purchasing for entry level jobs. Also, small organizations more frequently promote clerical workers or technicians into 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 may be assigned to the production planning section to learn about the purchasing system, inventory records, and storage facilities. They work with experienced buyers to learn about commodities purchased, prices, suppliers used, and negotiating techniques.

Following the initial training period, junior purchasing agents usually are given the responsibility for purchasing standard and catalog items. As they gain experience and develop expertise in their assigned areas, they may be promoted to purchasing agent, then senior purchasing agent.

Purchasing agents must be able to analyze the technical data in suppliers' proposals in order 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 in order to balance the needs of personnel in his or her organization with budgetary constraints, and negotiate with suppliers.

Workers with proven ability can move into a job as assistant purchasing manager in charge of a group of purchasing agents and then advance to manager of the entire purchasing department. Many purchasing managers move into executive positions as director of purchasing or director of materials management.

Continuing education is essential for purchasing agents who want to advance in their careers. Purchasing agents are encouraged to participate in frequent seminars offered by professional societies and to take courses in purchasing at local colleges and universities. The recognized mark of experience and professional competence in private industry is the designation Certified Purchasing Manager (CPM). This designation is conferred by the National Association of Purchasing Management, Inc., upon candidates who have passed four examinations and who meet educational and experience requirements. In government agencies, the indications of professional competence are the designations Professional Public Buyer (PPB) and Certified Public Purchasing Officer (CPPO), which are conferred by the National Institute of Governmental Purchasing, Inc. The PPB is earned by passing two written examinations and meeting certain educational and experience requirements. A candidate must have met a more stringent set of basic requirements, pass two different written exams,

and pass an oral exam as well in order to earn the CPPO.

Employment Outlook

Employment of purchasing agents is expected to increase faster than the average for all occupations through the 1980's. Several thousand jobs will be open each year as demand for purchasing agents increases and as workers die, retire, or transfer to other work.

Demand for purchasing agents is expected to rise as their importance in reducing costs is increasingly recognized. In large industrial organizations, the purchasing department will be expanded in order to handle the growing complexity of manufacturing processes. Companies that manufacture complex items such as industrial engines and turbines, electronic computer equipment, and communications equipment, there will be a growing need for persons with a technical background to select highly technical goods.

Many opportunities also should arise in firms providing personal, business, and professional services. Strong growth is expected for this sector of the economy, as a growing number of hospitals, school districts, and other relatively small employers are recognizing the importance of professional purchasers in reducing their operating costs.

Opportunities will be excellent for persons who have a master's degree in business administration. Persons with a bachelor's degree in engineering, science, or business administration whose college program included one course or more in purchasing also should have bright prospects. Graduates of 2-year programs in purchasing should continue to find ample opportunities, although they will probably be limited to small firms.

Earnings and Working Conditions

College graduates hired as junior purchasing agents in large firms earned about \$12,900 a year in 1978, according to surveys conducted by the Bureau of Labor Statistics. Experienced agents purchasing standard items averaged about \$16,200 a year; senior purchasing agents specializing in complex or technical goods averaged about \$19,600. Assistant purchasing managers received average salaries of about \$23,900 a year, while managers of purchasing departments received about \$29,500. 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 1978, purchasing agents earned almost twice as much as the average for all nonsupervisory workers in private industry, except farming.

In the Federal Government, beginning purchasing agents who had college degrees earned \$10,096 or \$12,505 in 1978, depending on scholastic achievement and relevant work experience. The average salary for all purchasing agents in the Federal Service was \$22,239. Salary levels vary widely among State governments; average earnings range

from \$11,549 to \$15,235 for purchasers of standard items, from \$15,856 to \$21,028 for senior buyers purchasing highly complex items, and from \$23,293 to \$29,781 for State purchasing directors.

Related Occupations

Other workers who negotiate and contract to purchase equipment, supplies, or other merchandise include retail buyers, purchase-price analysts, grain 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., 1001 Connecticut Ave. NW., Suite 922, Washington, D.C. 20036.

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 and parking facilities.

Urban and regional planners prepare for situations or needs 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 present information such as the arrangement of streets, highways, and water and sewer lines, and the location of schools,



Urban and regional planners map current and proposed future land uses when planning community growth.

libraries, and playgrounds. 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 subways. They also prepare materials that show how their programs can be carried out and the approximate costs.

Urban and regional planners often confer with private land developers, civic leaders, and officials of public agencies that do specialized planning. They may prepare materials for community relations programs, speak at civic meetings, and appear before legislative committees to explain and defend their proposals.

In small organizations, planners must be able to do several kinds of work. In large organizations, planners usually specialize in areas such as physical design, community relations, or the reconstruction of rundown business districts.

Working Conditions

Like other administrative workers, urban and regional planners spend most of their time in offices behind desks. To be familiar with areas that they are developing, however, they occasionally must spend time outdoors examining the features of the land under consideration for development, its current use, and the types of structures existing on it. Planners rarely work outdoors in bad weather, however. Although most planners have a scheduled 40-hour workweek, they sometimes must attend evening or weekend meetings or public hearings with citizens' groups.

Places of Employment

About 17,000 persons were urban and regional planners in 1978. Most work for city, county, or regional planning agencies. A growing number are employed by States or by the Federal Government in 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 private 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 1978, over 70 colleges and universities gave 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 re-

quired 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 achieve 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 outlining proposed studies, 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. Further advancement is more difficult at this level and often may only occur through a transfer to a large city, where the problems are more complex and the responsibilities greater.

Employment Outlook

Employment of urban and regional planners is expected to grow faster than the average for all occupations through the 1980's. Land-use planning activities are expected to increase in suburban and nonmetropolitan areas as populations grow. Opportunities also are expected to arise in fields, such as environmental or economic development planning in which planners have not been employed traditionally. In addition, some jobs will open up because of the need to replace planners who will die, retire, or transfer to other occupations.

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 than in recent years. As a result, some persons trained as planners will have to accept jobs in other areas of public administration.

Earnings

Urban and regional planners earned a median salary of about \$20,500 a year in early 1978—about twice as much as the average earnings for all nonsupervisory workers in private industry, except farming. Planners with master's degrees in urban or regional planning started at about \$13,500 a year in early 1978. Planners with a master's degree were hired by the Federal Government at \$15,920 a year in early 1979. In some cases, persons having less than 2 years of graduate work could enter Federal service as interns at yearly salaries of either \$10,507 or \$13,014. Salaries of urban and regional planners employed by the Federal Government averaged \$27,450 a year in early 1979.

State governments paid urban and regional planners average beginning salaries of about \$12,150 a year in mid-1978, although planners started at more than \$14,000 in some States. Salaries of experienced State planners ranged from an average minimum of nearly \$17,700 a year to an average maximum of more than \$23,500 a year. Salaries of State planning directors ranged from an average minimum of about \$26,000 to an average maximum of nearly \$32,000 in mid-1978.

City, county, and other local governments paid urban and regional planners median sal-

aries of more than \$19,000 a year in early 1978. Planning directors earned median salaries of more than \$23,000 a year. Most planners have sick leave and vacation benefits and are covered by retirement and health plans.

Related Occupations

Urban and regional planners develop plans for the orderly growth of urban and rural communities. A number of related occupations also engage in planning. Architects plan and design buildings for construction or alteration. Landscape architects lay out parcels

of land for development or recreation. City managers plan and administer community public services. Planning engineers design industrial plants for maximum efficiency. Transportation planning engineers plan transportation systems.

Sources of Additional Information

Facts about careers in planning and a list of schools offering training and job referrals are available from:

American Planning Association, 1313 East 60th St., Chicago, Ill. 60637.

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 1978, almost 13 million people were employed in service jobs. The major groups of service occupations are discussed below:

Food service occupations. The largest group of service workers, almost 4.3 million persons in 1978, prepared and served food in restaurants, cafeterias, schools, hospitals, and other institutions. Workers in this group included cooks and chefs, waiters and waitresses, bartenders, and kitchen workers.

Cleaning and related occupations. Workers in these occupations clean and maintain buildings such as apartments, houses, schools, and offices. More than 2.4 million persons were employed in these jobs in 1978. The group included janitors, building custodians, and pest controllers.

Health service occupations. More than 1.8 million persons were employed as health service workers in jobs such as practical nurses or hospital attendants. Most of these workers were employed in hospitals, but some worked in doctors' or dentists' offices.

Personal service occupations. Workers in this group range from barbers and cosmetologists to ski instructors and theater ushers. Almost 1.8 million persons were em-

ployed in personal service jobs.

Protective and related service occupations. Almost 1.4 million persons were employed to safeguard lives and property in 1978. The majority were police officers, guards, or firefighters. Most police officers and detectives were government employees, but some worked for hotels, stores, and other businesses. Guards, another large group of protective service employees, worked chiefly for private companies to protect company property and enforce company rules and regulations. Firefighters worked mainly for city governments. The remaining protective service workers were sheriffs and bailiffs, crossing guards and bridge tenders, and marshals and constables.

Private household service occupations. Most of the almost 1.2 million private household workers employed in 1978 were domestic workers who cleaned their employers' homes, prepared meals, and cared for children. Some worked as 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.

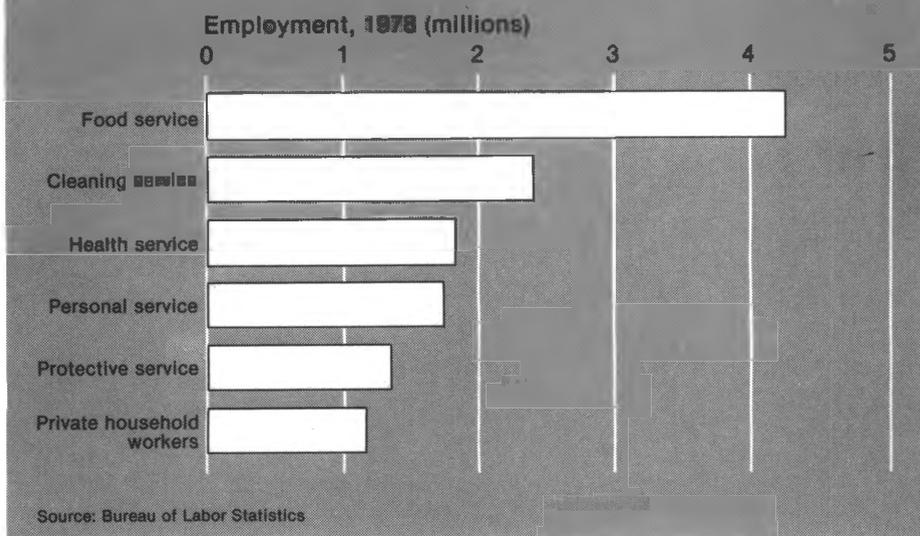
Some service workers eventually go into business for themselves as caterers or restaurant operators, for example, or proprietors of barber or beauty shops. Advancement from service occupations that require little training or skill may be difficult for people without a good basic education and some knowledge of the business in which they work.

Employment Outlook

Employment in the service occupations is expected to grow faster than the average for all occupations through the 1980's. Health services occupations will grow much faster than the average for all occupations, as population growth and the aging of the population will 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 most food service workers to grow as more people eat out. Employment of private household workers is expected to experience little change, despite a strong demand for these workers.

The following sections of the *Handbook* contain detailed information on most of the service occupations mentioned here. Others are described in the industry statements on government; transportation, communications, and public utilities; wholesale and retail trade; and service and miscellaneous industries. The health service occupations are included in the section on health care occupations.

More than one-third of all service workers are employed in food service occupations



Cleaning and Related 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. Much of this work is done by persons in cleaning and related occupations. These workers may clean floors and windows in hospitals, change linens in hotels, repair broken faucets in apartments, or exterminate insects and rodents in office buildings.

Workers in these occupations usually learn their skills on the job, but other training sometimes is available. Building custodians, for example, may attend training programs offered by unions and government agencies. Hotel 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.

This section describes three cleaning and related occupations: Building custodians, pest controllers, and hotel housekeepers and assistants.

Building Custodians

(D.O.T. 187.167-190; 381.137-010, .687-014, -018, -022; 382.664-010; and 891.137-010)

Nature of the Work

Building custodians, sometimes called janitors or cleaners, keep office buildings, hospitals, stores, and apartment houses clean and in good condition. Their routine includes necessary maintenance tasks such as fixing leaky faucets, emptying trash, minor painting and carpentry, replenishing bathroom supplies, and mowing lawns. They also see that heating and air-conditioning equipment works properly. On a typical day, a custodian may wet- or dry-mop floors, vacuum carpets, dust furniture, make minor repairs, and exterminate insects and rodents.

Custodians use many different tools and cleaning materials. For one job they may need a mop and bucket; for another an electric polishing machine and a special cleaning solution. Chemical cleaners and power



Schools employ many custodians.

equipment have made many tasks easier and less time consuming, but custodians must know how to use them properly to avoid harming floors and fixtures.

Some custodians supervise a group of custodial workers and are responsible for maintaining a section of a building or an entire building. They assign tasks to each worker, give instructions, and see that jobs, such as floor waxing or window washing, are done well.

Working Conditions

Because most office buildings are cleaned while they are empty, custodians often work evening hours. Some jobs, however, such as school custodian, call for daytime work. In buildings requiring 24-hour maintenance, custodians may work on shifts.

Although custodians usually work inside heated, well-lighted buildings, they sometimes work outdoors sweeping walkways, mowing lawns, or shoveling snow. Working with machines can be noisy and some tasks, such as cleaning bathrooms and trash rooms, can be dirty. Custodial workers may suffer minor cuts, bruises, and burns from machines, handtools, and chemicals.

Building custodians spend most of their

time on their feet, sometimes lifting or pushing heavy furniture or equipment. Many tasks, such as dusting or sweeping, require constant bending, stooping, and stretching.

Places of Employment

In 1978, almost 2.3 million people worked as building custodians. One-third worked part time.

Most custodians worked in office buildings and factories, but many others were employed in schools, apartment houses, hospitals, and recreation facilities, such as theaters and stadiums. Some worked for firms supplying building maintenance services on a contract basis.

Although custodial jobs can be found in all cities and towns, most are located in highly populated areas where there are many office buildings, stores, and apartment houses.

Training, Other Qualifications, and Advancement

No special education is required for most custodial jobs, but the beginner should know simple arithmetic and be able to follow instructions. High school shop courses are

helpful for minor plumbing or carpentry work.

Most building custodians learn their skills on the job. Usually, beginners do routine cleaning and are given more complicated duties as they gain experience.

In some cities, unions and government agencies have developed programs to teach custodial skills. Students learn how to clean buildings thoroughly and efficiently, and how to operate and maintain machines, such as wet and dry vacuums, buffers, and polishers, that they will use on the job. Instruction in minor electrical, plumbing, and other repairs also is given. As part of their training, students learn to plan their work, to follow safety and health regulations, to deal with people in the buildings they clean, and to work without supervision.

Building custodians usually find work by answering newspaper advertisements or applying directly to a company or a building maintenance service where they would like to work. They also get jobs through State employment offices. Custodial jobs in the government are obtained by applying to the civil service personnel headquarters.

Advancement opportunities for custodial workers usually are limited because the custodian is the only maintenance worker in many buildings. Where there is a large maintenance staff, however, custodians can be promoted to supervisory jobs. A high school diploma improves the chances for advancement. Some custodians go into the maintenance business for themselves.

Employment Outlook

Employment opportunities in this occupation are expected to be good through the 1980's. The need to replace workers who die, retire, or leave the occupation will create many jobs each year. Construction of new office buildings, hospitals, and apartment houses will cause employment of custodians to grow about as fast as the average for all occupations.

Persons seeking part-time or evening work can expect to find many opportunities.

Earnings

In 1978, building custodians averaged \$4.21 an hour, which is about three-fourths as much as the average earnings for all non-supervisory workers in private industry, except farming. Earnings, however, vary by industry and area of the country. Workers in large cities of the Northeast, North Central, and Western regions usually earn the highest wages.

Custodians working in the Federal Government are paid at the same rates offered by private industries in the local area.

Most building service workers receive paid holidays and vacations, and health insurance.

Related Occupations

Custodians are not the only workers who clean and maintain buildings. Some workers who have similar skills and job duties are trash collectors, floor waxers, sweepers, window cleaners, private household workers, sextons, gardeners, boiler tenders, hotel housekeepers, and pest controllers.

Sources of Additional Information

Information about custodial jobs and training opportunities may be obtained from the local office of your State employment service.

For general information on job opportunities in local areas, contact:

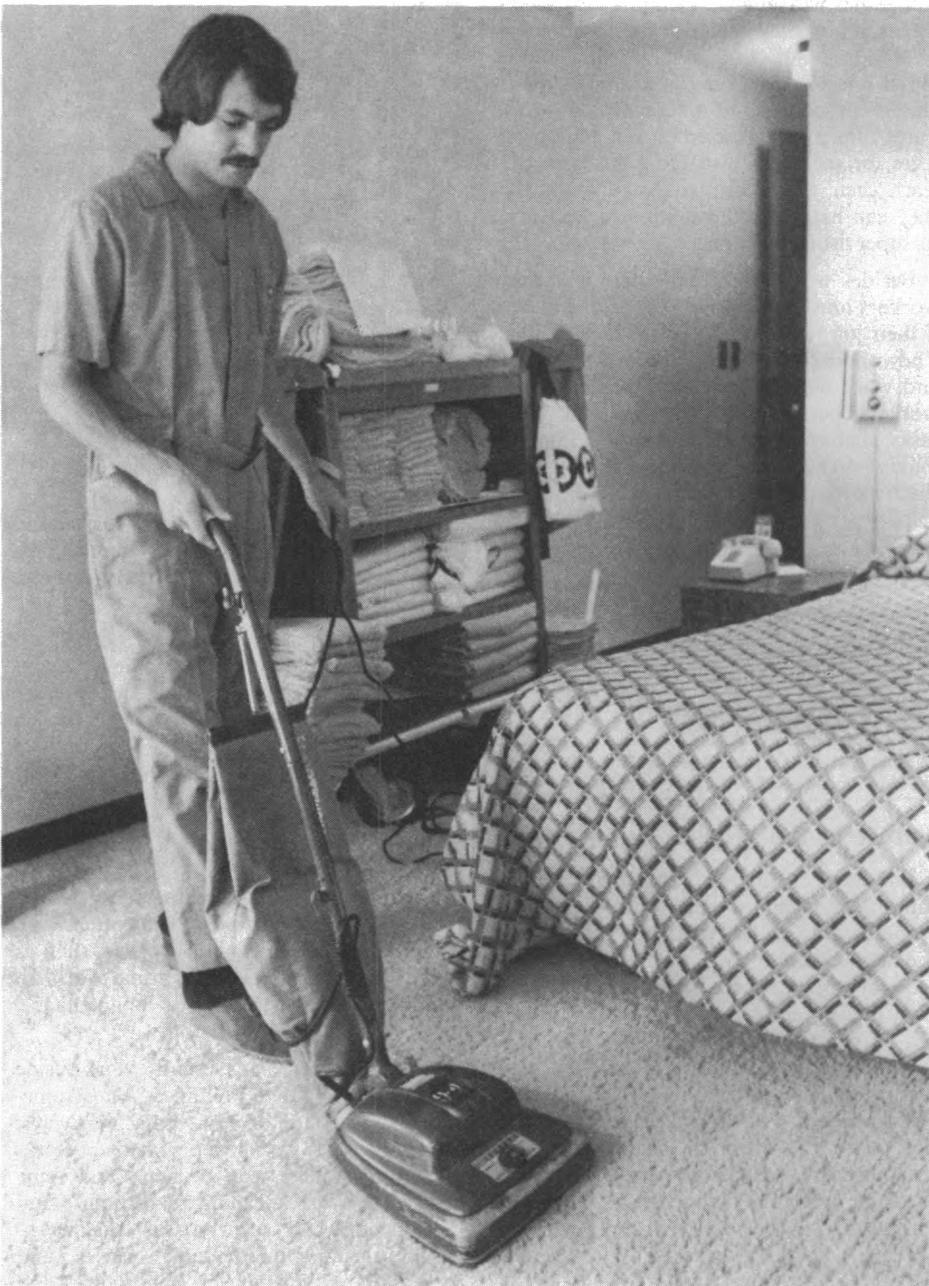
Service Employees International Union, 2020 K St. NW., Washington, D.C. 20006.

Hotel Housekeepers and Assistants

(D.O.T. 321 and 323 except 323.687-010)

Nature of the Work

A hotel or motel's reputation depends on how well it serves its guests. Although some offer economical accommodations and others stress luxurious surroundings and attentive service, all are concerned with their guests' comfort. Hotel housekeepers are responsible for keeping hotels and motels clean and attractive and providing guests with the necessary furnishings and supplies. It is their job to hire, train, schedule, and supervise the housekeeping staff, including linen and laun-



Housekeepers who work in small or middle-sized establishments may perform some household duties themselves.

dry workers, and repairers. They also keep employee records and order supplies. About 19,500 persons worked as hotel housekeepers in 1978.

Housekeepers who work in small or mid-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.

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.

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 & 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.

Employment Outlook

Employment of hotel housekeepers is expected to grow faster than the average for all occupations through the 1980's. Many openings will result from the need to replace workers who die, retire, or leave the occupation.

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.

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 is important. Other occupations involving similar responsibilities include apartment superintendents, janitorial service operators, pursers, and supervisory maintenance engineers.

Sources of Additional Information

See the chapter on the hotel industry elsewhere in the *Handbook* for information on earnings and working conditions, sources of additional information, and more information on the employment outlook.

Pest Controllers

(D.O.T. 383.361-010, .364-010, .367-010; and 389.684-010)

Nature of the Work

Rats, mice, and common household insects such as flies and roaches contaminate food and spread sickness; termites eat wood. Protecting us and our property from these pests is the job of professional pest controllers, who are classified either as pest control route workers or termite specialists. Although these fields of work are separate, many controllers do both.

Often working alone, a pest control route worker usually begins the day by making sure the route truck has the necessary pesticides, sprayers, traps, and other supplies for servicing customers' facilities. With the supervisor's instructions, the route worker starts out to visit the 5 to 15 customers on the route list.

A route worker generally services restaurants, hotels, food stores, homes, and other facilities that have problems with rats, mice, or insects. Commercial customers commonly have service contracts calling for regular vi-

sits, such as once a month. Service to homes usually is less frequent, or as required.

A route worker, who must know pests' habits and hiding places, carefully inspects the facility to determine the extent of the pest problem. To eliminate pests and prevent their return, the route worker sprays pesticides in and around areas such as cabinets and sinks where insects usually live, and sets traps and poisonous bait near areas where rats or mice nest and along paths they travel.

Although regular visits are helpful, the route worker may suggest to customers ways to eliminate conditions that attract pests. They may, for example, recommend replacing damaged garbage containers, sealing open food containers, and repairing cracks in walls.

Termite specialists are pest controllers who work to eliminate termites and prevent them from reaching wood structures. If not controlled, these insects can go virtually unnoticed until they severely undermine the wood structure of a home or other building.

Termite specialists, usually working in pairs, can effectively control termites by providing a poison barrier between the termites' underground colonies and the wood structure.

To provide a barrier, these workers insert a steel nozzle with holes into the ground and pump in termite poison through a hose attached to the nozzle. They repeat the process at numerous points around the foundation. To reach soil beneath or behind cement or other surfaces, they drill holes through the surface, insert the nozzle into the soil, and pump in the poison. They then seal these holes with cement. Specialists also may spray poison directly on to the wood's surface, especially on older, all-wood structures.

Since termites will not cross poisonous areas, those in the ground must find food elsewhere or starve while those trapped in the wood structure die from lack of moisture. Because barriers last for years, termite specialists seldom revisit a treated facility.

Termite specialists sometimes have to alter buildings to prevent pests from returning. For example, they may remove and rebuild foundations or insulate wood-to-earth contacts with concrete.

Helpers assist termite specialists by digging around and underneath houses, helping set up and operate equipment, mixing cement, and doing general cleanup work.

Some highly experienced specialists inspect houses for termites, estimate costs, and explain the proposed work to customers. In most exterminating firms, however, managers, supervisors, or pest control sales workers do these jobs.

Working Conditions

Generally, pest controllers work 40 to 44 hours a week. During spring and summer,



Pest controllers know the habits and hiding places of different insects.

however, hours may be longer because pests are more prevalent. Most work is done during the day. Route workers, however, occasionally work nights because many restaurants and stores do not want them to work while customers are present.

Pest controllers work both indoors and outdoors in all kinds of weather. They frequently lift and carry equipment and materials, but usually these items weigh less than 50 pounds. Route workers also do a great deal of walking and driving. Termite specialists occasionally must crawl under buildings and work in dirty, cramped spaces. Workers in these occupations are subject to some hazards. Although most pesticides are not harmful to humans, some can cause injury if they are inhaled or left on the skin. Such injuries, however, are avoided if safety precautions are followed. Termite specialists risk injury from power tools and sharp or rough materials in buildings.

Pest controllers are on their own to a great extent and may decide, within limits, how they will handle a job.

Places of Employment

More than half of the estimated 31,500 pest controllers employed in 1978 were route workers; the rest were termite specialists and combination route worker-termite specialists.

Most pest controllers work for or own firms that specialize in this service. A small number work for Federal, State, and local governments.

Jobs in this field can be found throughout the country. Employment, however, is concentrated in major metropolitan areas and large towns.

Training, Other Qualifications, and Advancement

Beginning pest controllers are trained by supervisors and experienced workers. Many large firms also provide several weeks of training, which includes classes on the characteristics of termites or other pests, the safe and effective use of pesticides, customer relations, and the preparation of work records. To aid beginners, many employers provide training manuals. Beginners gain practical experience by helping pest control route workers or termite specialists on the job. After a week or two of on-the-job training, and 2 or 3 months of detailed follow-up inspections, new employees can work alone.

Employers prefer trainees who are high school graduates, have safe driving records, and are in good health. Many firms require employees to be bonded; applicants must have a record of honesty and respect for the law. Because route workers frequently deal with customers, employers look for applicants who are courteous, tactful, and well-groomed. Termite specialists need manual dexterity and mechanical ability. Some firms give aptitude tests to determine an applicant's suitability for the work.

High school courses in chemistry and business arithmetic provide a helpful background for pest controllers. Students interested in

becoming route workers also may benefit from courses in sales. Those interested in becoming termite specialists can gain valuable experience by taking courses related to building construction such as carpentry.

Certification indicates competence in the field. To become certified, the pest controller must demonstrate in a written examination knowledge of pesticides and their safe use. Most States require pest control firms to have at least one certified pest controller available for consultation to noncertified workers.

Experienced workers with ability can advance to higher paying positions, such as service manager or pest-control sales worker.

Employment Outlook

Employment of pest controllers is expected to grow faster than the average for all occupations through the 1980's. In addition to the jobs resulting from growth in the demand for pest control, the need to replace experienced workers who retire, die, or transfer to other occupations also will create many job openings.

Because pests reproduce rapidly and tend to develop resistance to pesticides, their control is a never-ending problem. Population growth and further congestion of metropolitan areas will add to the need for more pest controllers. Older buildings which are more prone to infestation also increase the need for these workers.

Earnings

The starting pay for inexperienced trainees ranged from \$3.50 to \$4 an hour in 1978, based on the limited information available. Earnings of experienced pest controllers ranged from \$5 to \$9 an hour.

Some route workers are paid an hourly rate or weekly salary. Others receive a commission based upon charges to customers. Nearly all termite specialists are paid an hourly rate or weekly salary.

Related Occupations

Pest controllers spend much of their workday covering a route by truck to service customers. Other workers with similar duties include sales route drivers, carpet installers, glass installers, and household appliance installers.

Sources of Additional Information

Further information about opportunities in this field is available from local exterminating companies and the local office of the State employment service. General information about the work can be obtained from: National Pest Control Association, Inc., 8150 Leesburg Pike, Vienna, Va. 22180.

Food Service Occupations

Food service workers make up one of the largest and fastest growing occupational groups in the Nation's labor force. More than four times as many persons work in food service as in automobile manufacturing and steel manufacturing combined. In 1978, about 4.3 million persons were employed in food service, mostly in restaurants, hotels, factory and school cafeterias, and catering firms. Job opportunities exist almost everywhere and for almost any interested person, including those who have limited skills or little formal education.

There are no specific educational requirements for most food service work and skills usually are learned through on-the-job training. Many restaurants hire inexperienced persons as dining room attendants, dishwashers, food counter workers, waiters and waitresses, and bartenders. Experience sometimes is necessary, however, to obtain one of these positions in a large restaurant or catering firm. Previous employment in a food service occupation, such as 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.

Vocational schools, both public and private, offer courses in cooking, catering, and bartending. Employment of food service workers is expected to increase faster than the average for all occupations through the 1980's. The demand for these workers 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 allow people to eat out more often. Also, as more wives work, families are finding dining out a welcome convenience. Detailed discussions of the work, training, outlook, and earnings of dining room attendants and dishwashers, food counter workers, waiters and waitresses, cooks and chefs, and bartenders are presented in the statements that follow.

Bartenders

(D.O.T. 312.474 and .477)

Nature of the Work

Screaming Zombies, Harvey Wallbangers, Gold 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 and mixers. A well-stocked bar contains dozens of types and brands of liquor plus soft drinks, fruit juices, cream, and soda and tonic water. In addition, bartenders serve beer, wine, 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 also serve limited food items or snacks to customers seated at the bar, collect payment, operate the cash register, and clean up after customers who have left.

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, geometric displays, and often wash glassware.

Bartenders who work in large restaurants or hotels usually have *bartender helpers* (D.O.T. 312.687-010) to assist them with their duties. Helpers keep the bar supplied with liquor, mixes, and ice; stock refrigerators with beer and wine; and replace empty beer kegs with full ones. They also keep the area behind the bar clean and remove empty bottles and trash.

Many bartenders own their own 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. 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.

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.

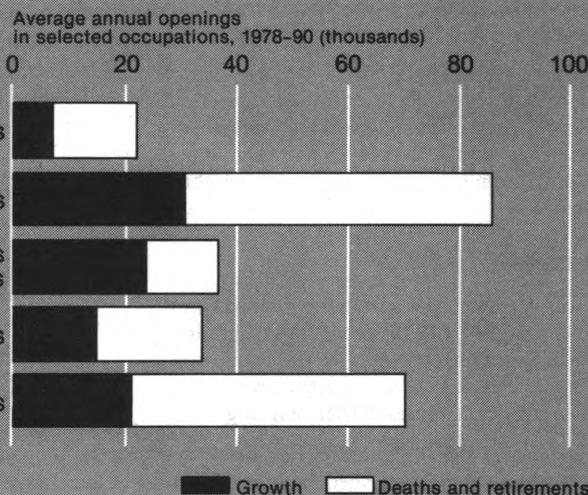
Places of Employment

Most of the 282,000 bartenders employed in 1978 worked in restaurants and bars; others had jobs in hotels and private clubs. Roughly one-fifth were self-employed.

Several thousand people, many of whom work in other occupations or attend college, tend bar part time. Often they serve at banquets and private parties which are held at restaurants, hotels, or even private homes.

Most bartenders work in the urban population centers of New York, California, and other large States, but many are employed in small communities. Seasonal employment is

Jobs will be plentiful in food service occupations as a growing need for these workers and high turnover create thousands of openings each year





Bartenders often are asked to mix drinks to suit a customer's taste.

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, dining room attendants, waiters, or waitresses. By watching a bartender at work, they can learn how to mix drinks and do other bartending tasks.

Some 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 must 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 from contagious diseases. In some instances, they must be bonded.

Small restaurants, neighborhood bars, and

resorts usually offer a beginner the best entry opportunities. After gaining experience, a bartender may wish to work in a large restaurant or cocktail lounge where pay is higher and promotion opportunities are greater. Although promotional opportunities in this field are limited, it is possible to advance to head bartender, wine steward, or beverage manager. Some bartenders open their own businesses.

Employment Outlook

Employment of bartenders is expected to increase faster than the average for all occupations through the 1980's. In addition to the job openings caused by employment growth, several thousand will arise annually from the need to replace experienced bartenders who retire, die, or leave the occupation for other reasons.

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 average incomes and more leisure time will allow people to go out for dinner or cocktails more often, and to take more vacations. Also, with both spouses working, families are finding dining out a welcome convenience.

Earnings

Hourly earnings of bartenders ranged from \$3.34 to \$6.53 in 1978, according to limited data from union contracts in the restaurant industry. Besides wages, bartenders usually receive tips that increase their earnings.

Bartenders usually receive free meals at work and may be furnished bar jackets or complete uniforms.

Related Occupations

Bartenders' duties include taking orders, serving drinks, and collecting payment from customers. Other workers who serve customers include short-order cooks, restaurant and coffee shop managers, sales clerks, and waiters and waitresses.

Sources of Additional Information

Information about job opportunities may be obtained from the State employment service.

For general information on job opportunities in bartending, write to:

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

Culinary Institute of America, P.O. Box 53, Hyde Park, N.Y. 12538.

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, whether it prides itself on "home cooking" or exotic foreign cuisine. Cooks and chefs are largely responsible for the reputation a restaurant acquires. Many chefs have earned fame for both themselves and the restaurants and hotels where they work because of their skill in creating 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 from a nearby bakery. 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 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 and poorly ventilated. 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



In fine restaurants, customers often ask for the chef's recipes.

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, and range from 37 1/2 to 48 hours a week. Cooks employed in public and private schools work during the school year only, usually for 9 months.

Places of Employment

About 1,186,000 cooks and chefs were employed in 1978. 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

Most 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 and post-high school vocational programs. 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.

Little 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, universities, professional associations, hotel management groups, and trade unions. The Armed Forces also are a good source of training and experience in food service work.

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 selection and storage of food, use of leftovers, determination of portion size, menu planning, food cost control, and purchasing food supplies in quantity. Students also learn hotel and restaurant sanitation and public health rules for handling food. Training in supervisory and 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 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.

Employment Outlook

Employment of cooks and chefs is expected to increase faster than the average for all occupations through the 1980's. In addition to employment growth, 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 population grows and people eat 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, as more wives work, families are finding dining out a welcome convenience.

Earnings

In 1978, hourly pay rates ranged from \$3.68 to \$7.15 for chefs, from \$2.90 to \$6.36 for cooks of various types, and from \$2.54 to \$4.97 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 minimum rates, and several chefs with national reputations earn more than \$40,000 a year.

The principal union organizing cooks and chefs is the Hotel and Restaurant Employees and Bartenders International Union.

Related Occupations

Cooks and chefs are not the only workers who create and then display a product to its best advantage. Other workers similarly involved include artists, bakers, clothes designers, and decorators. In addition, cooks and chefs may manage facilities ranging in size from a two person sandwich shop to a large restaurant's kitchen employing dozens of people. Other workers with similar management responsibilities include food service directors, executive housekeepers, and pursers.

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:

Culinary Institute of America, P.O. Box 53, Hyde Park, N.Y. 12538.

National Institute for the Foodservice Industry, 20 North Wacker Dr., Suite 2620, Chicago, Ill. 60606.

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

For information on the American Culinary Federation's apprenticeship program for cooks and chefs, write to:

American Culinary Federation, Educational Institute, 920 Long Blvd., Suite One, Lansing, Mich. 48910.

Dining Room Attendants and Dishwashers

(D.O.T. 311.677 except -014; 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. Dining room attendants and dishwashers provide the quick hands and sharp eyes needed to prevent such problems.

Attendants do many jobs that otherwise waiters and waitresses would have to do. They clear and reset tables, carry soiled dishes to the dishwashing area and bring in trays of food, and clean up spilled food and broken dishes. By taking care of these details, attendants give waiters and waitresses more time to serve customers.

Dining room attendants 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.

Dishwashers pick up where the attendants leave off—with the soiled dishes. They operate special machines that clean tableware quickly and efficiently. Occasionally, they

may have to make minor adjustments to keep machines operating properly. Dishwashers might clean large pots and pans by hand, or operate a mechanical pot and pan washer. In addition, they may clean refrigerators and other kitchen equipment, sweep and mop floors, and carry out trash.

Working Conditions

Most attendants and dishwashers 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, as these workers have to lift heavy trays filled with dishes, and large pots and pans.

Places of Employment

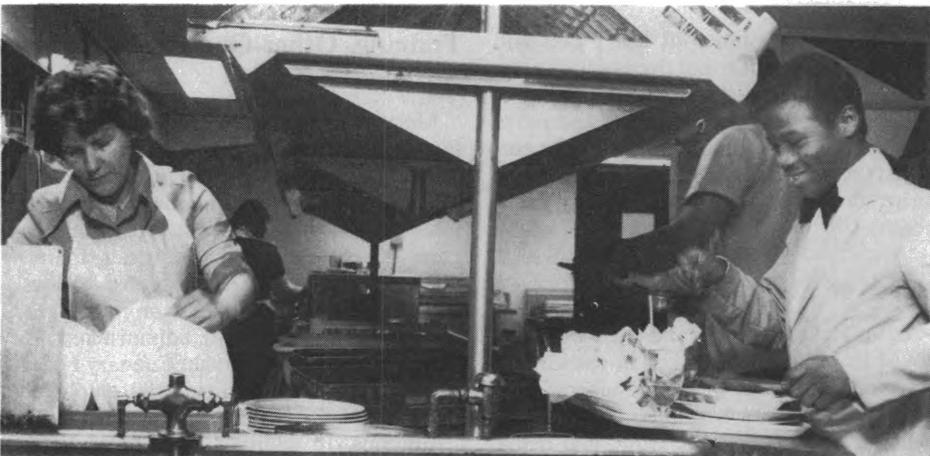
About 240,000 dishwashers and 215,000 attendants were employed in 1978. Many worked only part time.

Most attendants and dishwashers work in restaurants, bars, and hotels. Dishwashers also work in schools, hospitals, and other institutional feeding operations.

Training, Other Qualifications, and Advancement

A high school education is not needed to qualify for jobs as dining room attendants and dishwashers, and many employers will hire applicants who do not speak English. Attendants and dishwashers 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, attendants should be neat in appearance, have good personal hygiene, and get along well with people.

Promotions for dining room attendants



Dishwashers pick up where attendants leave off—with the dirty dishes.

and dishwashers are limited. Attendants sometimes advance to positions as waiter or waitress, and dishwashers 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.

Employment Outlook

Job openings for dining room attendants and dishwashers 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. About one-half of the attendants and dishwashers are students, most of whom work part time while attending school.

Additional openings will result from employment growth. Employment of dining room attendants and dishwashers is expected to increase much faster than the average for all occupations through the 1980's as population growth and higher incomes create more business for restaurants.

Earnings

Dining room attendants and dishwashers have relatively low earnings. Limited data from union contracts that cover restaurants and bars in several large cities indicate that hourly rates for these workers ranged from \$1.54 to \$4.28 in 1978. These amounts were below the average earnings of most other nonsupervisory workers in private industry, except farming.

In addition to wages, however, attendants may receive a percentage of waiters' and waitresses' tips. Patrons usually tip their waiter or waitresses between 10 and 20 percent of their checks, but locale and custom frequently determine the amount.

Employers usually furnish uniforms and a free meal. In addition, most attendants and dishwashers receive paid vacations and various types of health insurance and pension plans.

Related Occupations

Other jobs which require little formal education but provide comfort and convenience to people are bell captains, building custodians, 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 dining room attendants and dishwashers, write to: National Institute for the Foodservice Industry, 20 N. Wacker Dr., Suite 2620, Chicago, Ill. 60606. Culinary Institute of America, P.O. Box 53, Hyde Park, N.Y. 12538.

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

Food Counter Workers

(D.O.T. 311.137-010, .477-014, .674-010, .677-014; 319.474-010)

Nature of the Work

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. About 463,000 persons, most of whom worked part time, had food counter jobs in 1978.

Typical duties of counter workers 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 lunch-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. Weekend and holiday work often is required.

During busy periods, food counter workers must work quickly and effectively under pressure. Other job requirements include the ability to stand for long periods of time and to perform tasks within a restricted area. Unlike waiters, 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.

Training, Other Qualifications, and Advancement

For counter jobs that require totaling bills 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 some 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 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 lim-



Most counter workers learn their skills on the job.

ited, especially 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 or merchandiser (person in charge of stocking food). 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 show leadership ability may qualify for these programs.

Employment 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 higher incomes create more business for eating places. In addition, 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 \$1.70 to \$3.73 in 1978, based on limited data from union contracts that covered eating places in several large cities. These amounts were well below the average earnings for nonsupervisory workers in private industry, except farming. 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.

Related Occupations

Most food counter workers are employed in small restaurants and fast food places and often are rushed to take care of customers. Other workers who have similar jobs include sales clerks, waiters and waitresses, car hops, 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:

Educational Director, National Institute for the Foodservice Industry, 20 North Wacker Dr., Chicago, Ill. 60606.

Culinary Institute of America, P.O. Box 53, Hyde Park, N.Y. 12538.

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

Meatcutters

(D.O.T. 316)

Nature of the Work

Meatcutters prepare meat, fish, and poultry in supermarkets or wholesale food outlets. When the animal quarters and carcasses arrive from a meatpacking plant or central distribution center, meatcutters divide quarters into primal cuts, such as round, loins, and ribs, with a band saw. Then they use knives 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. They also may prepare sausage and corned beef. In addition, cutters 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.

Places of Employment

About 204,000 persons worked as meatcutters in 1978. They had jobs in almost every city and town in the Nation. Most meatcutters worked in retail foodstores, although a few worked in wholesale stores, restaurants, hotels, hospitals, and other institutions.

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.

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 various cuts and grades of meats and the proper use of tools and equipment. After demonstrating skill with tools, they learn to divide quarters into primal cuts and to di-



Customers often ask meat cutters to make special cuts.

vide primal cuts into individual portions. Trainees may learn to cut and prepare fish and poultry, roll and tie roasts, prepare sausage, and cure and corn meat. Later, they may learn marketing operations such as inventory control, meat buying and grading, 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.

Besides training requirements, 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 cutters 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.

Employment Outlook

The number of meatcutters is expected to decline slightly 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 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 most meatcutters averaged \$8.32 in 1978, according to a 1978 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 tended to earn 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, chicken and fish; salad makers, 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, 2800 North Sheridan Rd., Chicago, Ill. 60657.

Waiters and Waitresses

(D.O.T. 311.137-014 through .137-022; 311.477-018 through .477-038; and 311.674-018)

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 tables and clearing 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.

Places of Employment

About 1,383,000 waiters and waitresses were employed in 1978. More than half 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 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 dining room attendant, car hop, or food counter worker. Although most waiters and waitresses pick up their skills on the job, at least 3 months' experience is preferred by larger restaurants and hotels. Some public and private vocational schools, restaurant associations, and large restaurant chains provide classroom training. 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 appearance and an even disposition are important qualifications. Physical stamina also is important, 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 area are limited. After gaining some experience, however, a waiter or waitress may transfer to a larger restaurant where



In luxury restaurants, waiters and waitresses may suggest wines and explain the preparation of items on the menu.

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 rather than just take orders. 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.

Employment 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. About one-fourth of the waiters and waitresses are stu-

dents, most of whom work part time while attending school and then find other jobs after graduation. In addition to the job openings from turnover, many will result from employment growth.

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 higher incomes create more business for restaurants. Higher incomes and more leisure time will permit people to eat out more often. Also, as more wives work, families may 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 \$1.31 to \$3.54 in 1978, 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 and Restaurant Employees and Bartenders International Union.

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.

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

Culinary Institute of America, P.O. Box 53, Hyde Park, N.Y. 12538.

American Culinary Federation, Educational Institute, 920 Long Blvd., Suite One, Lansing, Mich. 48910.

Personal Service Occupations

Personal service workers perform a variety of tasks for people, such as styling or cutting hair, conducting tours, carrying baggage, or arranging funerals. Some of these tasks require special skills that must be learned through formal training. Others require skills that can be learned on the job. For some personal service jobs, workers must obtain a State license after completing a training program or apprenticeship.

Neatness, tactfulness, and the ability to deal effectively with people are necessary in the personal service field because success depends on the impression personal service workers make on their customers. Physical stamina is necessary for those jobs that involve lifting heavy objects or standing for long periods of time.

Personal service workers may receive salaries, commissions or both. In many cases they also receive tips that add substantially to their income. Employers often furnish uniforms for jobs that require them. Workers like barbers and cosmetologists must provide their own tools.

This section describes four personal service occupations: Barbers, cosmetologists, funeral directors and embalmers, and bellhops and bell captains.

Barbers

(D.O.T. 330.371-010 and 014; 332.271-018)

Nature of the Work

Although most men go to a barber for just a haircut, other 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, facial massages, and shampoos.

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. 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 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.

Places of Employment

Most of the 121,000 barbers in 1978 worked in barbershops. Some worked in unisex salons, and a few worked for government agencies, hotels, or department stores. More

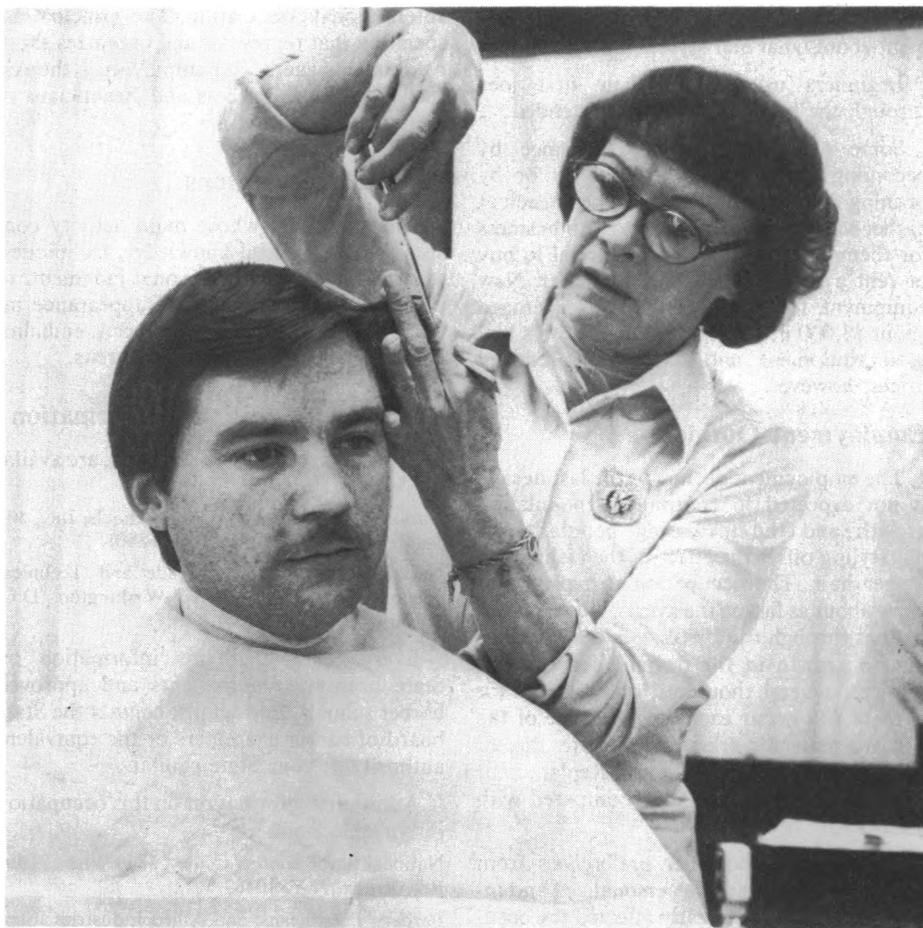
than half of all barbers operated their own businesses.

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 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



Barbers need steady, agile hands.

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 \$5 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 300 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 \$200. They study the basic services—haircutting, shaving, facial massaging, and hair and scalp treatments—and, under supervision, practice on customers in school “clinics.” 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 \$3,000 in 1978. Some shopowners buy used equipment and fixtures at reduced prices, however.

Employment 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 about as fast as the average for all occupations through the 1980's. Besides openings due to growth in the demand for barbers' services, several thousand job openings for barbers will occur each year because of the need to replace workers who retire, die, or transfer to other kinds of work. 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 regular 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.

Weekly earnings (including tips) of experienced barbers generally ranged between \$230 and \$290 in 1978, according to limited information available. Hairstylists usually earned \$360 to \$460 a week, because the services they provide are more personalized and therefore more expensive. Some hairstylists and a few barbers who operated their own shops earned more than \$500 a week. Beginning barbers usually earn about \$200 to \$230 a week, hairstylists \$230 to \$290 a week.

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 Barbers, Beauticians, and Allied Industries International Association. 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 using special knowledge, techniques, and tools, along with personal judgment, to improve a person's physical appearance include cosmetologists, electrologists, embalmers, makeup artists, and manicurists.

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.

Barbers, Beauticians, and Allied Industries International Association, 7050 West Washington St., Indianapolis, Ind. 46241.

Bellhops and Bell Captains

(D.O.T. 324.137, .477, and .677-010)

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 is in order and may offer information about valet services, restaurant hours, 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. Sometimes, they help arriving or departing guests, if a bellhop is unavailable. In 1978, more than 20,000 persons worked as bellhops and 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.

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 also must be able to stand for long periods, carry heavy baggage, and work independently.

Bellhops can advance to bell captain and then to superintendent of service, but opportunities are limited.

Employment Outlook

Employment of bellhops is expected to decline through the 1980's. Most openings will result from the need to replace workers who die, retire, or leave the occupation.

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. Opportunities also will be available in resort



Bellhops carry luggage and escort guests to their rooms.

areas where hotels and motels are open only part of the year.

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

See the statement on the hotel industry elsewhere in the *Handbook* for information on earnings and working conditions, sources of additional information, and more information on employment outlook.

Cosmetologists

(D.O.T. 331.674-010; 332.271-010, -014, and -018; 332.361-010; 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 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 ventilation. 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. About one-quarter of all cosmetologists work part time, usually during these busy hours.

Places of Employment

Most of the more than 542,000 cosmetologists employed in 1978 worked in beauty salons. Some worked in "unisex" shops, barber-styling shops, or department stores, and a few were employed by hospitals and hotels. About one-third 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-approved 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 over \$50. Beginning students work on manikins 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
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Sometimes cosmetologists help customers with makeup.

gists 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. A few work as examiners for State cosmetology boards.

Employment Outlook

Employment of cosmetologists is expected to grow about as fast as the average for all occupations through the 1980's as the population increases and the number of working women rises. The trend to hairstyling for men also creates a demand for these workers because many men go to unisex shops or beauty salons for styling services. In addition to openings due to growth in the demand for cosmetologists, thousands of cosmetologists will be needed each year to replace those who die, retire, or leave the occupation.

Despite rising demand, jobseekers may

face keen competition for the position of their choice. If current trends continue, trained cosmetologists will outnumber job openings by almost 2 to 1. However, numerous openings should be available for part-time work.

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 experienced cosmetologists generally ranged between \$330 and \$390 in 1978, according to limited information available. After 10 years of experience, they can earn more than \$500

a week. Beginners usually earned \$110 to \$145 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.

A few 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 union which organizes cosmetologists—both employees and salon owners—is the Barbers, Beauticians, and Allied Industries International Association. The principal trade association which represents and organizes salon owners, managers, and employees is the Associated Master Barbers and Beauticians of America. Other organizations include the National Hairdressers and Cosmetologists Association, Inc.; 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 occupations whose main activity consists of using special knowledge, techniques, and tools, along with personal judgment, to improve a person's physical appearance include barbers, electrologists, embalmers, makeup artists, and manicurists.

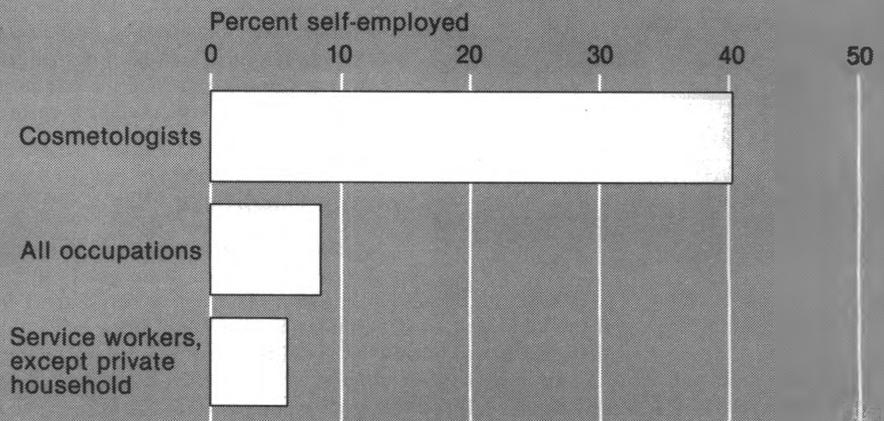
Sources of Additional Information

A list of approved training schools and licensing requirements can be obtained from State boards of cosmetology or from:

Cosmetology Accrediting Commission, 1735 K St. NW., Suite 1108, Washington, D.C. 20006

Additional information about careers in

Compared to other service workers, and the average for all occupations, a large proportion of cosmetologists are self-employed



Source: Bureau of Labor Statistics

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:

Barbers, Beauticians, and Allied Industries International Association, 7050 West Washington St., Indianapolis, Ind. 46241.

National Association of Cosmetology Schools, 808 Main St., Boonton, N.J. 07005.

Funeral Directors and Embalmers

(D.O.T. 187.167-030 and 338.371-014)

Nature of the Work

Few occupations require the tact, discretion, and compassion called for in the work of funeral directors and embalmers. The family and friends of the deceased may be under considerable emotional stress and may be bewildered by the many details of the occasion. The *funeral director* (D.O.T. 187.167-30) helps them to make the personal and business arrangements necessary for the service and burial. The *embalmer* (D.O.T. 338.371-014) prepares the body for viewing and burial. In many instances, one person performs both functions.

The director's duties begin when a call is received from a family requesting services. After arranging for the deceased to be removed to the funeral home, the director obtains the information needed for the death certificate, such as date and place of birth and cause of death. The director makes an appointment with the family to discuss the details of the funeral. These include time and place of service, clergy and organist, selection of casket and clothing, and provision for burial or cremation. Directors also make arrangements with the cemetery, place obituary notices in newspapers, and take care of other details as necessary. Directors must be familiar with the funeral and burial customs of various religious faiths and fraternal organizations.

Embalming is a sanitary, preservative and cosmetic measure. Embalmers, perhaps with the help of resident trainees (apprentices), first wash the body with germicidal soap. The embalming process itself replaces the blood with a preservative fluid. Embalmers apply cosmetics to give the body a natural appearance and, if necessary, restore disfigured features. Finally, they dress the body and place it in the casket selected by the family.

On the day of the funeral, directors provide cars for the family and casketbearers, receive and usher guests to their seats, and organize the funeral procession. After the service they may help the family file claims

for social security, insurance, and other benefits. Directors may serve a family for several months following the funeral until such matters are satisfactorily completed.

Working Conditions

Funeral directors and embalmers often work long hours and may be required to be "on call" and within quick traveling distance of the funeral home. Some employees work shifts; for example, nights 1 week, and days the next.

Occasionally embalmers may come into contact with contagious diseases, but the possibility of their becoming ill is remote, even less likely than for a doctor or nurse.

Places of Employment

About 45,000 persons were licensed as funeral directors and embalmers in 1978. A substantial number of the directors were funeral home owners.

Most of the 22,000 funeral homes in 1978 had 1 to 3 directors and embalmers, including the owner. Many large homes, however, had 20 or more. Besides the embalmers employed by funeral homes, several hundred worked for morgues and hospitals.

Training, Other Qualifications, and Advancement

A license is needed to practice embalming. State licensing standards vary, but generally an embalmer must be 21 years old, have a high school diploma or its equivalent, graduate from a funeral service college, serve a 1- or 2-year resident traineeship, and pass a State board examination. One-half of the States require a year or more of college in addition to training in mortuary science.

All but six States also require funeral directors to be licensed. Qualifications are similar to those for embalmers, but directors may have to take special apprenticeship training and board examinations. Most people entering the field obtain both licenses, however some States issue a single license to embalmer/funeral directors. Information on licensing requirements is available from the State office of occupational licensing.

High school students can start preparing for a career in this field by taking courses in biology, chemistry, and speech. Students may find a part-time or summer job in a funeral home. Although these jobs consist mostly of maintenance and clean-up tasks, such as washing and polishing funeral coaches, they can be helpful in gaining familiarity with the operation of funeral homes.

In 1978, 35 schools had mortuary science programs accredited by the American Board of Funeral Service Education. About one-half were private vocational schools that offer 1-year programs emphasizing basic subjects such as anatomy and physiology as well as practical skills such as embalming tech-

niques and restorative art. Community colleges offer 2-year programs, and a small number of colleges and universities offer 2- and 4-year programs in funeral service. These programs included liberal arts and management courses as well as mortuary science. All programs offered courses in psychology, accounting, and funeral law.

State board examinations consist of written and oral tests and actual demonstration of skills. After passing the examination and meeting other requirements, resident trainees receive a license to practice. If they want to work in another State, they may have to pass its examination, although many States have mutual agreements that make this unnecessary.

Important personal traits for funeral directors are composure, tact, and the ability to communicate easily with the public. They also should have the desire and ability to comfort people in their time of sorrow.

Advancement opportunities are best in large funeral homes where directors and embalmers may earn promotion to higher paying positions such as personnel manager or general manager. Some workers eventually acquire enough money and experience to establish their own businesses.

Employment Outlook

Little change in the employment of funeral directors and embalmers is expected through the 1980's. Demand for funeral services will rise as the population grows and deaths increase. Most funeral homes, however, will be able to meet the demand without expanding their employment. The average funeral home conducts only one or two funerals each week and is capable of handling several more without hiring additional employees.

In recent years, the number of funeral service college graduates has approximately equaled the number of jobs available due to retirements, deaths, and transfers to other occupations. Because there are a limited number of employers in any geographical area, many students should secure a promise of employment before entering a program. However, barring any significant growth in enrollments, future graduates should find job opportunities available.

Earnings

In 1978, funeral directors and embalmers generally earned from \$11,000 to \$17,000 a year. Resident trainees earned between \$135 and \$220 a week. Managers generally earned between \$13,000 and \$24,500 a year, and many owners and officers of homes earned more than \$35,000. In addition, the majority of funeral homes have health or life insurance programs, and many homes provide directors with clothing allowances.

In large funeral homes, employees usually have a regular work schedule. Typically they put in 8 hours a day, 5 or 6 days a week. Occasionally, however, overtime may be necessary.

Sources of Additional Information

Information about job opportunities in this field is available from local funeral homes and from:

National Funeral Directors Association of the

United States, Inc., 135 W. Wells St., Milwaukee, Wisc. 53203.

National Selected Morticians, 1616 Central St., Evanston, Ill. 60201.

For a list of accredited schools of mortuary

science and information about scholarship opportunities, contact:

The American Board of Funeral Service Education, Inc., 201 Columbia St., Fairmont, W. Va. 26554.

Private Household Service Occupations

About 1.4 million workers were employed in private households in 1978. The majority were domestic workers who performed household tasks such as cooking, cleaning, or caring for children, but workers in other occupations also were employed by private households. Gardeners keep the grounds of large estates looking attractive by planting shrubs and flowers and cutting the lawn. Chauffeurs drive their employers' cars and keep the vehicles clean and in good running condition. Carpenters, painters, and other craft workers maintain and redecorate homes. Private nurses, secretaries, and curators or librarians are employed in some households.

The following chapter discusses the domestic occupations most frequently found in private households, including general housekeeper, mother's helper, and companion.

Private Household Workers

(D.O.T. 099.227-010, 301., 302., 305., and 309., except 309.345)

Nature of the Work

Thousands of people employ private household workers to help care for children, clean and maintain the house and yard, cook meals, or serve the family. Some household workers specialize in one of these jobs, but the duties of most workers change from day to day. Frequently, workers who specialize live in their employer's house.

Most private household workers are employed as *general houseworkers* or *mothers' helpers*. These workers clean the house and may also be responsible for preparing meals, doing the laundry, or caring for children. When hired by the day or hour, they are called *day workers*.

Heavy household tasks and yard maintenance usually are performed by *caretakers*. Their work includes jobs such as washing windows, painting fences, and mowing the lawn.

In some households, meals are prepared by *cooks*. Depending on their training or the wishes of their employer, a cook's duties may range from planning menus and buying food to serving meals and cleaning the kitchen. In some households, cooks may be assisted by a *cook's helper*, who is less skilled than a cook and performs sim-

ple tasks, such as peeling vegetables and cleaning the kitchen.

A few households employ *launderers* to wash, iron, and fold the laundry.

Some private household workers specialize in performing personal services for members of the family. *Personal attendants* keep their employers' clothes pressed and hung, make their beds, help them dress, and run errands. *Companions* do similar work, but they also act as a friend or aide to the convalescent, elderly, or handicapped person who employs them.

The most rapidly growing type of private household worker is the person whose sole job is child care. Unlike mothers' helpers whose duties generally include some light housekeeping, these workers' sole responsibility is caring for children. They bathe the children, prepare their meals, launder their clothes, and supervise their play. Those who care for very young children are responsible for sterilizing bottles, preparing formulas, and changing diapers. Some households employ tutors to take charge of school-age children. These workers supervise their recreation, diet, and health, as well as their education. They also are responsible for disciplining the children.

A household with a large staff of workers may employ a *home housekeeper* or a *butler* to supervise the staff and the operation of the household. These workers usually are responsible for hiring and firing the other household employees. In addition to these duties, butlers receive and announce guests, answer telephones, serve food and drinks, and may act as gentleman's attendants. Housekeepers order food and cleaning supplies and keep a record of expenditures.

Working Conditions

Most private household workers receive instructions from their employers but are free to work on their own. Frequently, they have a key to the house or apartment. Household work is often tedious, especially for day workers who generally are given less desirable tasks, such as cleaning bathrooms or defrosting the refrigerator. Long or irregular working hours can isolate workers who "live in" from their families and friends, and, if they are the sole employees in the households, they are likely to be alone most of the time.

Places of Employment

Nearly 1.2 million persons were employed as private household workers in 1978. Most

are employed part time, working half-days or only 2 or 3 days a week. Those who live in their employer's house often work more than 40 hours a week.

Training, Other Qualifications, and Advancement

For most household jobs, experience and an ability to cook, clean, or care for a yard is more important than formal education. Employers prefer workers who know how to operate vacuum cleaners, floor waxers, and lawnmowers, but most young people can learn these skills while helping with the house and yard work at home. Some household workers acquire skills by spending a year working as a mother's helper under the supervision of either an experienced household worker or their employer.

Home economics courses in high schools, vocational schools, and junior colleges offer training in child development and meal preparation that can be very useful to persons interested in becoming cooks or child care workers. Training programs sponsored by Federal agencies, State employment service offices, and local welfare departments also teach many of the skills needed for household work.

For a person wishing a job serving as a companion or caring for children, educational and cultural background is more important than work experience. Generally a companion's background, interests, and age should be similar to the employer's, and practical nursing experience is useful if the employer is an invalid. Being able to read well or carry on an interesting conversation is helpful. A well-rounded education and teaching skills are important for persons interested in caring for children.

Private household workers must have physical stamina because they are on their feet most of the time and sometimes must do some heavy lifting. The desire to do a job carefully and thoroughly is important. Household workers should be able both to get along well with people and to work independently. Some workers, particularly cooks and infant's nurses, need a health certificate showing that they are free of contagious diseases. Many employers arrange and pay for the necessary physical examination.

Advancement other than an increase in wages generally is not possible in private household work. Few households require live-in workers, and even fewer require so many workers that a butler or home housekeeper is needed as a supervisor. Work-



Child care workers are the fastest growing group of private household workers.

ers can transfer to better paying and more highly skilled household jobs, such as cook or lady's or gentleman's attendant, but job openings in these occupations are limited.

Employment Outlook

Although the number of private household workers is expected to decline through the 1980's, thousands of openings will result each year from the need to replace those who die, retire, or leave the occupation. The demand for household workers has exceeded supply for some time, as more women, especially

those with young children, enter the labor force. Low wages, the tedious nature of some household tasks, and the lack of advancement opportunities discourage many persons from entering the occupation, however, and some prospective employers are turning to child-care centers and commercial cleaning services for help.

Job openings for domestic workers, particularly for general housekeepers and mothers' helpers, will be plentiful through the 1980's. Many opening will be available for part-time work.

Earnings

Private household workers are covered by Federal and State minimum wage laws. In 1978, the minimum wage was \$2.65. Some private household workers earn more than the minimum wage, as wages vary according to the work performed, employer's income, and the custom of the local area. Earnings are highest in large cities, especially in the North.

Related Occupations

Many private household workers use their training and experience to transfer to related jobs—in child-care or day-care facilities, or as kitchen workers in restaurants. Some may go to work as building cleaners, employed by commercial cleaning services. Others may go to work as nursing aides in hospitals or nursing homes, or as homemaker-home health aides in health agencies, public welfare departments, or commercial firms.

Sources of Additional Information

Facts about employment opportunities and training programs in private household work are available from local offices of State employment agencies.

Information on laws affecting household workers and guidelines for work is available from:

National Committee on Household Employment, 7705 Georgia Ave. NW., Suite 208, Washington, D.C. 20012.

Household Employment Program, National Urban League, Inc., 500 E. 62d St., New York, N.Y. 10021.

Protective and Related Service Occupations

The growth of our Nation's population and economy has put an increasing emphasis on protective services. Each city, suburban area, and national port of entry requires protective and related service workers to check crime, minimize loss of life and property, and enforce regulations that protect the health and safety of our citizens at home and on the job.

Careers in protective and related service occupations require varied combinations of education and experience. Workers such as FBI special agents and some Federal Government inspectors must have at least a bachelor's degree, while guards may have less than a high school education. Most occupations in this group, 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 workers in protective and related services 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 honesty and an understanding of human nature are important. Persons seeking careers in protective and related service occupations should desire to serve the community and be able to exercise proper judgment under a variety of conditions.

This section describes the work of several occupations in protective and related services: Correction officers, FBI special agents, firefighters, guards, police officers, State police officers, occupational safety and health workers, and health, regulatory, and construction inspectors.

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 counsel inmates.

To make sure inmates are orderly and obey rules, correction officers keep a close watch on everything the inmates do—working, exercising, eating, and bathing. They give and oversee work assignments for inmates, as well as instruct and help them on specific tasks. Sometimes it is necessary to search inmates for forbidden items, such as weapons or drugs, to settle disputes between inmates, and to enforce discipline.

They 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 to make sure all are present during transfers and activities.

Correction officers examine 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 keep a 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.

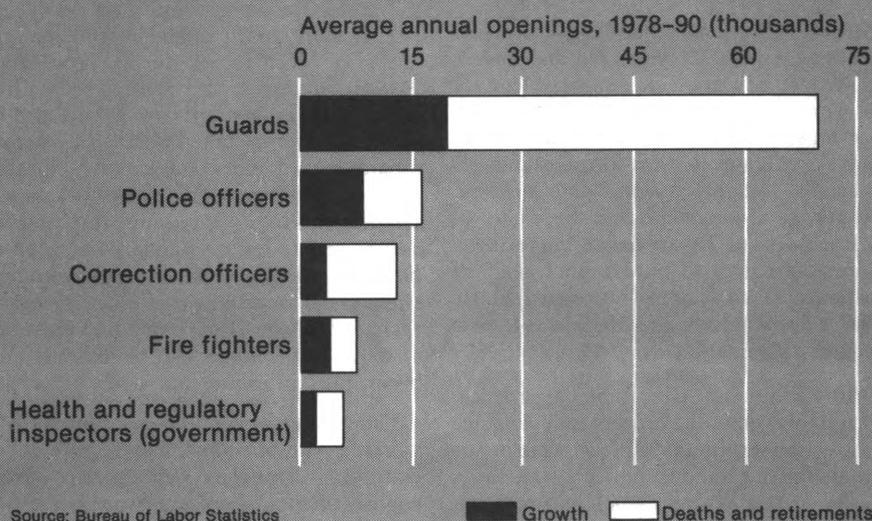
Counseling and helping inmates with problems also is an important part of the correction officer's job. Officers play a key role in rehabilitation by helping inmates adjust to institutional life, prepare for later civilian life, and avoid future criminal behavior. In some institutions, officers lead or participate in group counseling sessions. More often, however, the counseling is informal. Officers may arrange a change in a daily schedule so that an inmate has an opportunity to 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.

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.

Working Conditions

Correction officers may work indoors or outdoors, depending on 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 occasion-

The number of job openings expected in protective service work varies widely among occupations





Correction officers oversee work assignments of inmates and instruct them in specific tasks.

ally have been injured or killed during disturbances.

Correction officers usually work an 8-hour day, 40-hour week. Prison security must be provided around the clock, which means some officers work weekends, holidays, and nights. During emergencies, officers may work overtime, for which they receive straight time, time-and-one-half, or equal time off.

Places of Employment

There were about 100,000 correction officers in 1978. More than 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.

Training, Other Qualifications, and Advancement

The Federal Government, as well as almost every State and a few localities, provide training for correction officers. Some States—Maryland and New York are two—

have special training academies. Most States, however, provide informal on-the-job training.

Academy trainees generally receive 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 the guidance of an experienced officer. Experienced officers sometimes receive inservice training to keep abreast of new ideas and procedures.

Most penal systems require that correction officers be at least 21 years old and have a high school education or its equivalent, or else work experience that qualifies them. They must be in good health. Many States require candidates to meet formal standards of height, weight, vision, 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.

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.

Employment Outlook

Employment of correction officers is expected to increase faster than the average for all occupations through the 1980's. Expansion of correctional facilities together with a likely growth in the inmate population is expected to create many new jobs for correction officers. Many additional job openings will result from job turnover and the need to replace workers who die or retire.

Earnings

In 1978, salaries for correction officers varied widely by level of government. At the Federal level, the starting salary was \$10,500 per year; correction sergeants and other supervisory officers could advance to maximum salaries of more than \$20,000 per year. The average salary for all Federal correction officers and correction sergeants was \$14,900 per year.

At the State level, correction officers averaged a starting salary of \$10,000 per year in 1978 and a maximum salary of \$13,000 a year, although they could earn maximum salaries of more than \$16,000 in some States. Correction sergeants averaged from minimum of \$11,600 to maximum of \$15,300 at the State level, although they could earn more than \$19,000 in some States.

At the local level, starting salaries in 1978 averaged \$7,900 a year for correction officers and \$9,800 a year for supervisors.

Most officers get paid vacation and sick leave as well as a pension upon retirement. They usually are given uniforms or an allowance to purchase their own. Most correction officers 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 court rooms 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. *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 careers open to persons interested in working with offenders, may require college education. *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.

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, and sabotage. 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 or 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. 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 are assigned to work together.



Newly appointed FBI special agents receive intensive training in the use of firearms.

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.

Places of Employment

About 8,000 persons were special agents in 1978. 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) established under field office supervision to provide prompt and efficient handling of investigative matters arising throughout the field office territory. Some agents are assigned to the Bureau headquarters in Washington, D.C., which supervises all FBI activities.

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 or a college graduate with a major in accounting. The law school training must have been preceded by at least 2 years of undergraduate college work.

From time to time, as the need arises, the FBI accepts applications from persons who

have a 4-year college degree with a physical science major or fluency in a foreign language, or who have 3 years of professional, executive, complex investigative, or other specialized experience.

Applicants for the position of FBI special agent must be citizens of the United States, 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, 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.

Each newly appointed special agent is given about 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. After assignment to a field office, the new agent usually works closely with an experienced agent for about 2 weeks before handling any assignments independently.

All administrative and supervisory jobs are filled from within the ranks by selecting those

FBI special agents who have demonstrated the ability to assume more responsibility.

Employment 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 \$17,532 in late 1978. Special agents are not appointed under Federal Civil Service regulations, but, like other Federal employees, they receive periodic within-grade salary raises if their work performance is satisfactory; they can advance in grade as they gain experience. Salaries of supervisory agents start at \$32,442 a year.

Agents frequently work longer than the customary 40-hour week and, under specified conditions, receive overtime pay up to \$4,400 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)

Nature of the Work

Every year, fires destroy thousands of lives and 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 a company officer such as lieutenant, captain, or other department officer: They may connect hose lines to hy-

drants, operate a pump, or position ladders. Because their duties may change several times while the company is in action, they must be skilled in many different firefighting activities, such as rescue, ventilation, and salvage. Some firefighters operate fire apparatus, emergency rescue vehicles, and fire-boats. In addition, they help people to safety and administer first aid.

Most fire departments also are responsible for fire-prevention activities. 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, 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 rapidly respond, regardless of the weather or hour. They may spend long periods outdoors fighting fires in adverse weather.

Firefighting is among the most hazardous occupations. The job of a firefighter involves risk of death or injury from sudden cave-ins of floors or toppling walls and danger 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 standard 40 hour week, many fire fighters average as many as 56 hours a week. In addition to scheduled hours, firefighters often must work extra hours when they are 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.

Places of Employment

More than 220,000 persons worked as firefighters in 1978. Nine out of ten worked in municipal fire departments. Some very large cities have several thousand firefighters on the payroll while many small towns have fewer than 25. Some firefighters work in fire

departments on Federal installations; others work at airports and in large manufacturing plants.

Training, Other Qualifications, and Advancement

Applicants for municipal firefighting jobs must pass a written test, a medical examination, and tests of strength, physical stamina, and agility, as specified by local regulations. These examinations are open to persons who are at least 18 years of age, meet certain height and weight requirements, and have a high school education or the equivalent. Those who receive the highest scores on the examinations have the best chances for appointment. Extra credit usually is given for military service. Experience gained as a volunteer firefighter or through training 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 practice drills, the recruits study firefighting techniques, fire prevention, local building codes, and first aid; also, they learn how to use axes, chemical extinguishers, ladders, and other 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, first aid, and fire prevention and safety.

Experienced firefighters often continue to study to improve their job performance and prepare for promotional examinations. To progress to higher level positions, firefighters must acquire a great deal of expertise related to firefighting, building construction, emergency first aid, 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 a high degree of discipline and effi-



Operation of complicated fire apparatus requires organization and teamwork.

ciency as well as direct the activities of the 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. Chances for advancement generally depend upon each candidate's position on the promotion list, as determined by the score on a written examination, his or her supervisor's rating, and seniority.

Employment 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. Thousands of jobs will become available each year due to growth and the need to replace those who die, retire, or leave the occupation. 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 as volunteer firefighters are replaced by professionals. Additional firefighters also may be required as more cities shorten the workweek for firefighters.

The number of firefighters in a community ultimately depends upon the availability of funds from the municipal government for salaries and equipment. Fire protection is an essential service, and citizens are likely to exert considerable pressure on city officials to expand fire-protection coverage. However, local governments must live within their

budgets. This means that in some financially troubled cities, firefighter employment probably will remain at current levels or decline, while in other cities, employment is likely to increase substantially to meet the needs of an expanding population.

The number of people who qualify for firefighter jobs in large cities usually is greater than the number of job openings, even though the written examination and physical requirements eliminate many applicants. Therefore, competition among candidates in urban areas is apt to remain keen. Opportunities should be much better in smaller communities.

Earnings

In 1978, entrance salaries for beginning full-time firefighters averaged \$12,700 a year, ranging from about \$11,000 to \$14,500 a year, depending on city size and region of the country. Maximum salaries averaged \$15,800 and varied from \$14,200 to \$18,000 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-half 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 when fire emergencies occur, firefighters quickly respond so that destruction and loss of life are minimized. 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 the Nation's homes and workplaces and design fire prevention programs and automatic fire detection and extinguishing systems. Other related occupations in which workers must 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.

National Fire Protection Association, 470 Atlantic Ave., Boston, Mass. 02210.

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 except .667-022 and -026.)

Nature of the Work

Guards patrol and inspect property to protect it against fire, theft, vandalism, and illegal entry. The specific duties of these workers, however, 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 in shipment 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 or exhibits from fire, theft, or damage. They also answer routine questions from visitors and sometimes guide traffic.

In large factories, aircraft plants, and defense installations where valuable information must be protected, some 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.

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 machines for janitorial workers.

Guards usually are uniformed and often carry a nightstick or 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 separately in the section on protective service occupations

Working Conditions

Guards work both indoors and outdoors patrolling buildings, industrial plants, and their 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 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.

Places of Employment

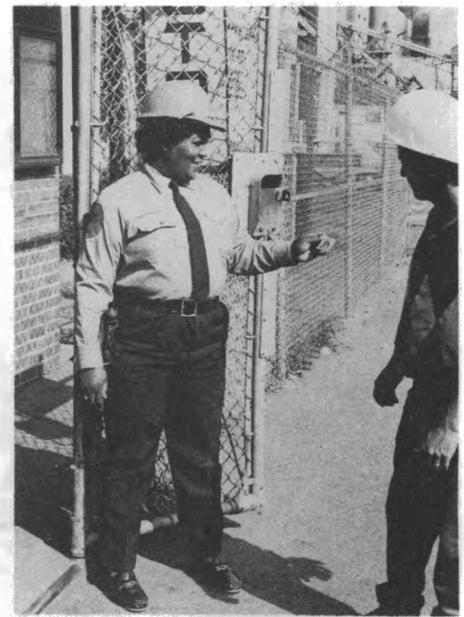
In 1978, almost 550,000 persons worked as guards. Most work in office buildings, government installations and buildings, stores, hotels, banks, schools, and manufacturing plants. Industrial security firms and guard agencies employ about 30 percent of all guards; agency guards work under contract in private business establishments and in some government facilities.

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 usually are tested for their reading and writing abilities and their competence in following written and oral instructions. 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 be veterans, have some ex-



Guard checks the credentials of plant visitor.

perience as guards, and pass a written examination. 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 handle various emergencies, 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.

Employment Outlook

Employment of guards is expected to grow faster than the average for all occupations through the 1980's. Increased concern for crime and vandalism will heighten the need for security in and around plants, stores, and recreation areas and is expected to cause rapid 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.

Earnings

Guards working in 36 urban areas were estimated to average \$3.63 an hour in 1978, 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 \$5.04 in manufacturing; \$5.29 in transportation and public utilities; \$4.10 in banking, finance, insurance, and real estate; \$4.22 in wholesale trade; \$3.70 in retail trade; and \$2.61 in the various service industries, including security and guard agencies. Guards employed by industrial security and guard agencies generally earned less than those employed directly by business.

Depending on their experience, newly hired guards in the Federal Government earned between \$8,366 and \$9,391 a year in early 1979. Guards employed by the Federal Government averaged \$11,500 a year. These workers usually receive overtime pay as well as a wage differential for the second and third shifts. Guards generally have paid vacations, sick leave, and insurance and pension plans.

Related Occupations

Guards protect property, maintain security, and enforce standards of conduct. Other related security and protective service occupations include: bailiffs, border guards, bouncers, deputy sheriffs, fish and game wardens, house or store detectives, life-guarders, 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 except .167-026, -042, .263-018, and .363-010; and 377 except 377.667-010)

Nature of the Work

The security of our Nation's cities and towns greatly depends on the work of local police officers and sheriffs' deputies whose jobs 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, as 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. Recruits may be assigned to such varied areas as congested business districts or outlying residential areas. They may cover their beats alone or with other officers. They may ride in a police vehicle or walk on "foot" patrol. In any case, they 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 also watch for stolen automobiles and enforce traffic regulations. At regular intervals, they report to police headquarters through call boxes, by radio, or by walkie-talkie. They prepare reports about their activities and may be called on to testify in court when cases result in legal action.

Working Conditions

The scheduled workweek for police officers usually is 40 hours. Because police protection must be provided around the clock in all but the smallest communities, some officers are on duty over weekends, on holidays, and at night. Police officers are subject to call any time their services are needed and may work overtime in 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.

Places of Employment

About 450,000 full-time officers worked for local police departments in 1978. Some cities have very large police forces. For example, New York has about 25,000 police officers and Chicago has nearly 13,000. Hundreds of small communities employ fewer than 25 officers each.

Training, Other Qualifications, and Advancement

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 and weight standards. Eligibility for appointment depends on performance in competitive examinations as well as on education and experience. The 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



Police officers on traffic duty investigate accidents and enforce traffic regulations.

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 line 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 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 sociology and psychology. In 1978, more than 800 junior colleges, colleges, and universities offered programs in law enforcement or criminal justice. Other courses helpful in preparing for a police career include English, American history, civics and government, business law, and physics. Physical education and sports are especially helpful in developing the stamina and agility needed for police work.

In some large cities, young persons who have completed high school can enter police work as police cadets, or trainees, while still in their teens. As paid civilian employees of the police department, they attend classes to learn police skills and do clerical work. They may be appointed to the regular force at age 21 if they have all the necessary qualifications.

Before their first assignments, officers usually go through a period of training. In small communities, recruits learn by working for a short time with experienced officers. Training provided in large city police departments is more formal and may last several weeks or a few months. This training includes classroom instruction in constitutional law and civil rights; in State laws and local ordinances; and in accident investigation, patrol, and traffic control. Recruits learn how to use a gun, defend themselves from attack, administer first aid, and deal with 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 laboratory work, traffic control, communications, or work with juveniles. Promotions to the rank of 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 performance on the job and prepare for advancement. Through training given at police department academies and colleges, officers keep abreast of crowd-con-

trol techniques, civil defense, legal developments that affect their work, and advances in law enforcement equipment. Many police departments encourage officers to work toward college degrees, and some pay all or part of the tuition.

Employment 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.

Police work is attractive to many. The job frequently is challenging and involves much responsibility. Furthermore, layoffs are rare. Although the 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 1978, entry level salaries for police officers employed in medium- and large-sized cities averaged nearly \$13,200 a year, although they varied widely from city to city. In some smaller communities, officers started at less than \$9,000 a year, while some major cities offered over \$15,000 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 averaged \$16,650 a year in early 1978, and exceeded \$18,000 a year in some areas. Promotion to a higher rank brings a higher basic salary. In general, police officers were paid about one and one-half times as much as nonsupervisory workers in private industry, except farming.

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 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. 375.163-010 and -014, .167-018 and .263-018)

Nature of the Work

The laws and regulations that govern the use of our Nation's roadways are designed to insure the safety of all citizens. State police officers (sometimes called State troopers or highways patrol officers) patrol our highways and enforce these laws.

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 to be used in determining 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 some States also investigate crimes such as burglary or assault, particularly in areas that do not have a local police force. They sometimes help city or county police catch lawbreakers and control civil disturbances. State highway patrols, however, normally are restricted to vehicle safety and traffic matters on state highway.

Some officers work with special State police units, such as the mounted police, canine corps, and marine patrols. 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, including division or bureau chiefs responsible for training or investigation and those who command police operations in an assigned area, have administrative duties.

Working Conditions

Although the work of State police officers is usually routine, it sometimes is dangerous. They always run the risk of an automobile accident while pursuing speeding motorists or fleeing criminals. Officers also face the risk of injury while apprehending criminals or controlling disorders. In addition, they must be on patrol in all kinds of weather.



State police officers issue traffic tickets to motorists who violate the law.

Places of Employment

About 47,000 State police officers were employed in 1978. The size of State police forces varies considerably. The largest force (in California) has over 5,000 officers; the smallest (in North Dakota) has about 100. 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. All candidates must be citizens of the United States. 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 meet physical and personal qualifications. Physical requirements include standards of height, weight, and eyesight. Tests of 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.

Although State police officers work independently, they must perform their duties in line with department rules.

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, 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. Although the organization of police forces varies from State to State, the typical avenue of advancement is from private to corporal, to sergeant, to first sergeant, to lieutenant, and then to captain.

In some States, high school graduates may enter State police work as cadets. These paid civilian employees of the police organization attend classes on aspects of police work and are assigned nonenforcement duties. Cadets who qualify may be appointed to the State police force at age 21.

Employment Outlook

State police employment is expected to grow about as fast as the average for all occupations through the 1980's. Some openings will also 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 officers to work in highway patrol. In ever-increasing numbers, Ameri-

cans have been using the motor vehicle as a means of transportation and a source of 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 uniformed officers.

Earnings

In 1978, beginning salaries for State police officers averaged about \$13,200 a year. Officers generally receive regular salary increases, based on experience and performance, until a specified maximum is reached. Maximum salaries averaged \$17,000 a year, but ranged to nearly \$19,000 a year in some States. Salaries are normally higher than average in the West and lower in the South. State police officers on the average earn about one and one-half times as much as nonsupervisory workers in private industry, except farming.

Starting salaries of State police sergeants averaged \$15,450 a year in 1978; maximum salaries averaged \$19,300. Starting salaries of lieutenants averaged \$17,900 a year; maximum salaries, \$22,100.

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. Paid vacations, sick leave, medical insurance, and life insurance plans frequently are provided.

In most States, the scheduled workweek for police officers is 40 hours. 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.

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.

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



An inspector making sure the methods and materials used in the construction of this house meet the local building code.

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.

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.

Places of Employment

About 20,000 persons worked as government construction inspectors in 1978. More than three-fourths 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 3,500 construction inspectors employed by the Federal Government in 1978, worked for the Department of Defense, primarily for the U.S. Army Corps of Engineers.

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.

Employment Outlook

Employment of government construction inspectors is expected to grow faster than 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.

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 1978, most construction inspectors working for the Federal Government earned between \$13,000 and \$19,000 a year, with the average about \$15,000.

According to limited information, salaries for inspectors working for State or local governments ranged from \$10,000 to \$20,000 a year, with top supervisors earning somewhat more than \$20,000 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 some similar skills are drafters, estimators, industrial engineering technicians, surveyors, and technical illustrators.

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.

Health and Regulatory Inspectors (Government)

(D.O.T. 168.167-010, -022, and -062; .264-010; .267-018 and -022; .267-042 through -066, -074, and -078; and .287)

Nature of the Work

Protecting the public from health and safety hazards, prohibiting unfair trade and employment practices, and raising revenue are included in the wide range of responsibilities of government. Health and regulatory inspectors help insure observance of the laws and regulations that govern these responsibilities. For discussion of a third 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. Many accountants, agricultural cooperative extension service workers, and other agricultural professionals also have inspection duties.

Health Inspectors. Health inspectors work with engineers, chemists, microbiologists, and health workers to insure compliance with public health and safety regulations governing food, drugs, and various 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 that is closely related to food inspection—agricultural commodity grading.

Most *consumer safety inspectors* specialize in one area of inspection such as food, feeds and pesticides, weights and measures, or drugs and cosmetics. Some, especially those who work for the Federal Government, may

be proficient in several of these areas. Working individually or in teams under the direction of a senior or supervisory inspector, they periodically check firms that produce, handle, store, and market food, drugs, and cosmetics. They look for evidence of inaccurate product labeling, decomposition, chemical or bacteriological contamination, and other factors 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 types of equipment.

Product samples collected as part of their examinations are sent to laboratories for analysis. After completing their inspection, inspectors discuss their observations with the management of the plant and point out any areas where corrective measures are needed. They prepare written reports of their findings, and, when necessary, compile evidence that may be used in court if legal actions must be taken to effect compliance with 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 the general supervision of a veterinarian, they inspect meat and poultry slaughtering, processing, and packaging operations.

They also check to see that products are labeled correctly and that proper sanitation is maintained in slaughtering and processing operations.

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

Environmental health inspectors, or sanitarians, work primarily for State and local governments. These inspectors perform a variety of inspection duties to help 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.

Environmental health inspectors concerned with waste control oversee the treatment and disposal of sewage, refuse, and garbage. They examine places where pollution is a danger, perform tests to detect 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 areas of work such as milk and dairy products, food sanitation, waste control, air pollution, institutional sanitation, and 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 various commodities to insure that retailers and consumers receive good 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 samples of a particular product to determine its quality and grade, and issue official grading certificates. Graders also may inspect the plant and equipment to insure that adequate sanitation standards are maintained.

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

Immigration inspectors interview and examine people seeking admission, readmission, or the privileges of passing through or residing in the United States. They inspect the passports of those seeking to enter the United States to determine whether they 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 by aliens for privileges such as immigrating to or living temporarily in the United States.

Customs inspectors enforce the laws governing U.S. 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 or carried by the passengers and crew of ships, aircraft, and motor vehicles to insure that all merchandise being brought through ports of entry is declared and the proper taxes paid.

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

Mine inspectors work to insure the health and safety of miners and to promote good mining practices. To insure compliance with safety laws and regulations, mine inspectors



Consumer safety inspectors check food for evidence of inaccurate labeling, decomposition, or contamination.

visit mines and related facilities to obtain information on health and safety conditions.

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

Wage-hour compliance inspectors inspect the employer's time, payroll, and personnel records to insure compliance with the provisions of various 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 any complaints.

Alcohol, tobacco, and firearms inspectors insure that the industries which manufacture these products comply with the provisions of revenue laws and other regulations on operating procedures, unfair competition, and trade practices. They spend most of their time inspecting 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 periodically audit these establishments to determine that appropriate taxes are correctly determined and paid.

Working Conditions

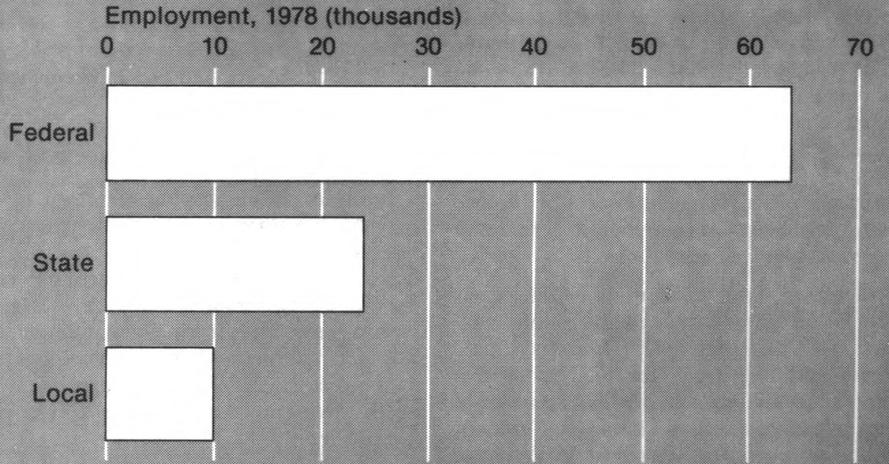
Most health and regulatory inspectors live an active life, meeting many people and working in a variety of environments. Many travel frequently and are usually furnished with an automobile or reimbursed for travel expenses.

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 spend a great deal of time in mines where they are exposed to the same hazards as miners. Many inspectors work long and often irregular hours.

Places of Employment

About 100,000 persons worked as health and regulatory inspectors in 1978. Nearly two-thirds of all health and regulatory inspectors work for the Federal Government, although State and local governments also employ large numbers. The largest single employer of consumer safety inspectors is the U.S. Food and Drug Administration, but the majority work for State governments. Food inspectors and agricultural commodity graders who work in processing plants are employed mainly by the U.S. Department of Agriculture. Agricultural quarantine inspectors work either for the U.S. Public Health Service or the U.S. Department of Agriculture. Environmental health inspectors work

Most health and regulatory inspectors are employed by the Federal Government



Source: Bureau of Labor Statistics

primarily for State and local governments.

Regulatory inspectors work for various agencies within the Federal Government, mainly in regional and district offices throughout the United States. Air safety inspectors work for the Federal Aviation Administration; wage-hour compliance officers and mine inspectors, for the Department of Labor; and alcohol, tobacco, and firearms inspectors, for the Treasury Department. Immigration, customs, and agricultural quarantine inspectors work at U.S. airports, seaports, border crossing points, and at foreign airports and seaports. They are employed by the Justice and Treasury Departments.

Training, Advancement, and Other Qualifications

Because inspectors perform such a wide range of duties, 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 consumer safety inspectors. To take this examination, a bachelor's degree or 3 years of responsible work experience, or a combination of the two, are required. In most cases, agencies will give preference to an applicant whose course work or experience is related to the field of employment.

Food inspectors must pass an examination based on specialized knowledge, in addition to having experience in related fields.

Air safety inspectors must have considerable experience in aviation maintenance, and an FAA Air Frame and Power Plant certificate. In addition, various pilot certificates and considerable flight experience are required, with the type dependent on the in-

spection duties. Many air safety inspectors receive both flight training and mechanical training in the Armed Forces. No written examination is required.

Applicants for mine safety inspector positions generally must have specialized work 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 for inspectors at the State and local level usually are similar to those for Federal employees. However, this may vary among government employers, particularly at the 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 and their qualifications regulated by examining boards.

All inspectors are trained in the laws and inspection procedures related to their specific field 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.

All Federal Government inspectors are promoted on a Civil Service "career ladder." This means that, assuming satisfactory work performance, workers will advance automatically, usually at 1-year intervals, to a specified maximum level. Above this level (usually supervisory positions), advancement is com-

petitive, based on needs of the agency and individual merit.

Employment Outlook

Employment of health and regulatory inspectors as a group is expected to increase about as fast as the average for all occupations through the 1980's. The growth in employment of health and regulatory inspectors is expected to be rapid at the Federal and local levels. In addition to job opportunities stemming from growth in the need for inspectors, many inspectors will be needed each year to replace those who die, retire, or transfer to other occupations.

Increased food consumption caused by population growth and greater public concern over potential health hazards should create additional jobs for food, consumer safety, and environment health inspectors, as well as for agricultural commodity graders. Public concern for improved quality and safety of consumer products also may result in new legislation in these areas, requiring additional inspectors to insure compliance.

Aviation industry growth, increased international travel, and increases in the volume of U.S. imports and exports should continue to create new openings for air safety, agricultural quarantine and immigration inspectors, and customs inspectors. Increasing coal mining activity and concern over mine safety should create additional mine inspector jobs. Continued public pressure for equal employment rights should cause a growing need for wage-hour compliance officers.

Earnings

With the exception of mine inspectors and aviation safety officers, the Federal Government paid health and regulatory inspectors and graders starting salaries of \$10,507 or \$13,014 a year in 1979, depending on the type of position and the qualifications of the applicant. Aviation safety officers and mining inspectors usually received starting salaries of \$15,920.

Salaries of experienced food inspectors, agricultural quarantine inspectors, alcohol, tobacco, and firearms inspectors, and customs and immigration inspectors were over \$16,000 a year in 1979. Experienced consumer safety inspectors, mine inspectors, and wage-hour compliance officers usually received salaries of more than \$20,000 from the Federal Government in 1979. Experienced aviation safety officers averaged over \$23,000 a year.

Nonsupervisory environmental health inspectors working for selected U.S. cities and counties received average starting salaries of about \$12,500 in 1978; those working for State governments started at about \$1,500 less. Experienced environmental health inspectors working for State governments earned between \$12,700 and \$16,800 but those in top supervisory and administrative positions had salaries between \$18,200 and \$24,300 in 1978.

Related Occupations

Health and regulatory inspectors are responsible for seeing that government laws and regulations are obeyed. Related occupations with similar law enforcement responsibilities include bank examiners, revenue agents, construction inspectors, State and local police officers, and fish and game wardens.

Sources of Additional Information

Information on inspector careers in the Federal Government is available from State employment service offices or from U.S. Office of Personnel Management area offices or Federal Job Information Centers located in various 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 career opportunities as inspectors in State and local governments is available from State civil service commissions, usually located in each State capital, or from local government offices.

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 and .367-010; and 821.367-014)

Nature of the Work

People in the occupational safety and health field have the challenging job of insuring a safe and healthful environment for workers and safe products for consumers. Safety and health workers in a number of different occupations strive to control occupational accidents and diseases, property losses, and injuries from unsafe products. 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*. Although all of them are concerned with preventing accidents, their specific tasks depend on where they work. For example, the safety engineer working in a large manufacturing plant (D.O.T. 012.-061-014) may develop a comprehensive safety program covering several thousand employees. This usually entails detailed analysis of each job in the plant to identify potential hazards so that preventive measures can be taken. When accidents do occur, safety engineers in manufacturing plants 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 is the cause of an accident, safety engineers may establish

training courses for plant workers and supervisors or reemphasize existing ones.

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. They also inspect heavy rigs, such as trucks and trailers, to 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 machinery, or lead rescue activities during emergencies.

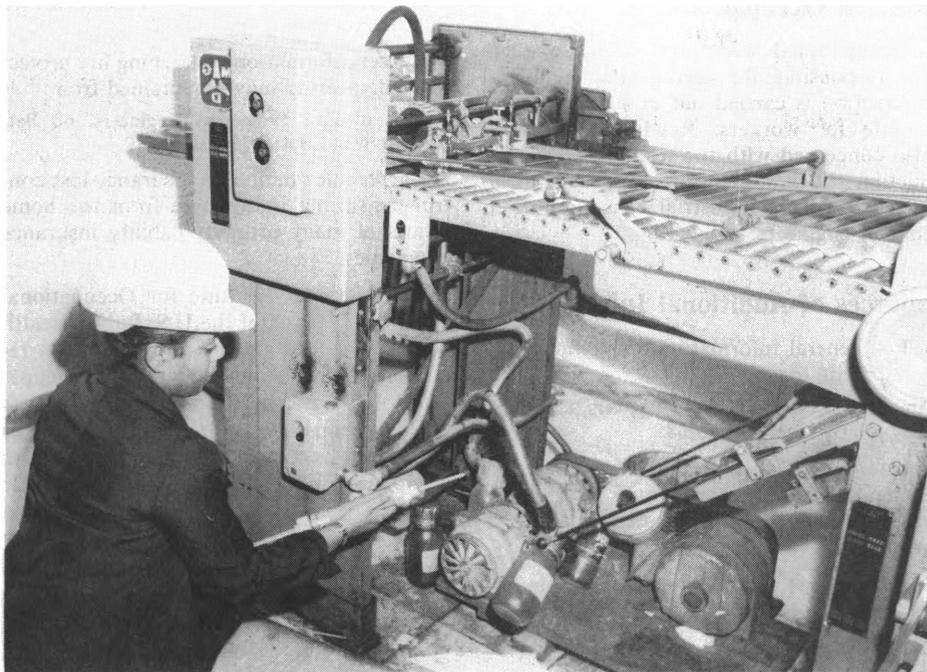
Many safety engineers are directly concerned with the safety of their company's product. They work closely with design engineers to develop models that meet all safety standards, and they monitor the manufacturing process to insure the safety of the finished product.

Safeguarding life and property against loss from fire, explosion, and related hazards is the job of the *fire protection engineer* (D.O.T. 012.167-026). Those who specialize 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 hazards and devise ways to correct them. For example, new 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 where they work. One who works for a fire equipment manufacturing company may design new fire protection devices, while engineers in consulting firms work with architects and others to insure that fire safety is built into new structures. In contrast, fire protection engineers working for insurance rating bureaus (organizations that calculate basic costs of insurance coverage in particular areas) inspect private, commercial, and industrial properties to evaluate the adequacy of fire protection for the entire area. Many fire protection engineers have special expertise in one area or more of fire protection, such as sprinkler or fire detection systems.

Losses in the workplace cannot be reduced without measures to eliminate hazards to workers' health. Designing and maintaining a healthful work environment are the responsibilities of *industrial hygienists* (D.O.T. 079.161-010). These health professionals are concerned with how noise, dust, vapors, and other hazards common to the industrial setting affect workers' health. After a problem is detected, perhaps by analyzing employee medical records, the industrial hygienist at the job site may take air samples, monitor noise levels, or measure radioactivity levels in the areas under investigation.

Other industrial hygienists work in private



Safety engineers inspect plant machinery for potential hazards.

laboratories or in those maintained by large insurance companies or industrial 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. For example, these health professionals may work with government officials, environmental groups, labor organizations, and plant management to develop a system to screen harmful substances before they enter and pollute a river.

Loss control and occupational health consultants (D.O.T. 168.167-078) in property-liability insurance companies perform many services for their clients. These range from correcting a single hazard in a small business to devising a program to eliminate or reduce all losses arising out of a large firm's operation. When dealing with a new account, the consultant makes a thorough inspection of 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 have to travel a great deal if they don't work exclusively at a single plant. The amount of travel required depends

upon job specialty and geographic location. For example, the plant safety engineer may travel only to seminars and conferences, while the insurance consultant may spend about half the time traveling between work-sites. Usually, a car is furnished or workers are reimbursed for the expenses of using their own vehicles.

Places of Employment

An estimated 80,000 persons were engaged in occupational safety and health work in 1978. About half of them were safety engineers, and most of the rest were fire protection engineers, industrial hygienists, or workers who divided their time between two or more of these areas. A relatively small number of occupational safety and health workers were employed as technicians.

The largest numbers of occupational safety and health workers were employed by manufacturing firms, although they were employed by firms in most other industries as well. Property and liability insurance companies employ many safety and health workers to provide engineering, consulting, and inspection services to their clients. Others worked for a variety of industrial, manufacturing, and commercial concerns.

Occupational safety and health workers are generally employed in population and industrial centers. Insurance consultants generally have their headquarters in a region's major city and travel to and from the sites they visit.

Training, Other Qualifications, and Advancement

Entry level safety and health professionals generally need at least a bachelor's degree in engineering or science. A more specialized degree, such as one in safety management,

industrial safety, mechanical or chemical engineering, or fire protection engineering, often is helpful in getting a good job. Many employers prefer applicants with a graduate degree in areas such as industrial hygiene, public health, safety engineering, or occupational safety and health engineering, or those with prior industrial work experience. Some employers will hire graduates of 2-year college curriculums as technicians, particularly if they have work experience related to the job.

Continuing education is necessary 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. Certification is conferred by the Board of Certified Safety Professionals and the American Board of Industrial Hygiene, after the candidate completes the required experience and passes an examination. A small number of States require that occupational safety and health professionals be licensed.

In addition to possessing technical competence, safety and health workers must be able to communicate well and motivate others. They should be able to adapt quickly to different situations, being 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, move up to larger branch offices, and finally take an executive position in the home office. In industrial firms, they can advance to plant safety and health manager or corporate manager over several plants. Although extensive experience is required, technicians can advance to professional safety and health positions.

Employment Outlook

Employment of safety and health workers is expected to increase faster than the average for all occupations through the 1980's as concern grows for occupational safety and health and consumer safety. Many openings will arise also to replace workers who die, retire, or leave their jobs for other reasons.

Much of the employment growth is expected to occur in industrial and manufacturing firms. Many firms now without a safety and health program are expected to establish one, and others will upgrade and expand existing programs in response to government requirements, union interest, and rising in-

surance 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 curriculums and persons with graduate degrees in related areas.

Earnings

Occupational safety and health workers had median salaries of \$27,000 a year in 1978, more than twice the average earnings for nonsupervisory workers in private industry, except farming. Safety and health workers were paid average starting salaries of \$14,500 a year in 1978. 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 are responsible for seeing 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, write to:

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

Information is also available from the Society on colleges and universities offering degree programs in the occupational safety and health field.

Information concerning a career in industrial hygiene is available from:

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

Career information concerning fire protection engineering may be obtained from:

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

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

The National Institute for Occupational Safety and Health of the U.S. Public Health Service provides general 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. This information is available from:

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

Other Service Occupations

Mail Carriers

(D.O.T. 230.363-010 and .367-010)

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 tote a heavy load of mail in a satchel or push it in a cart. In outlying suburban or rural areas, a car or small truck is used to deliver mail. Residential carriers cover their routes only once a day, but 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 apartments, which have all the mailboxes on the first floor.

Besides making deliveries, carriers collect postage-due and c.o.d. cash on delivery fees and obtain signed receipts for registered, certified, and, sometimes, 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. They turn in the mail receipts and money collected during the day and may separate letters and parcels so that they can be canceled easily.

Many carriers have more specialized duties. Some deliver only parcel post while others collect mail from street boxes and office mail chutes. 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 and letters to be registered or insured.

All carriers answer customers' questions about postal regulations and service 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.



Mail carriers often tote mail in a heavy satchel when making deliveries on foot.

The job, however, has its advantages. Carriers who begin work early in the morning are through by early afternoon. They are also free to work at their own pace as long as they cover their routes within a certain period of time.

Places of Employment

The U.S. Postal Service employed 245,000 mail carriers in 1978, 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 and at least 18 years old. They must qualify on a written examination that tests their clerical accuracy and abilities to memorize mail distribution systems, read, and do simple arithmetic.

If the carrier job involves driving, 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 general 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 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 sometimes work as many as 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.

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. Advancement possibilities are limited, but carriers can look forward to obtaining preferred routes or higher level jobs such as carrier technician as their seniority increases.

Employment Outlook

Employment of mail carriers is expected to increase more slowly than the average

for all occupations through the 1980's. Although the number of homes and business establishments is expected to increase along with growth in population and business activity, anticipated cutbacks in the frequency of mail delivery should limit the need for additional carriers. Nevertheless, thousands of job openings will result from the need to replace experienced carriers who retire, die, or transfer to other occupations. Openings will be concentrated in metropolitan areas.

Earnings

In 1978, experienced full-time mail carriers earned an average salary of \$17,168 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 \$14,603 a year and could rise to a maximum of \$17,188 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 \$7.27 an hour in 1978, with provision for periodic increases up to \$8.56 an hour after 8 years of satisfactory service.

The earnings of rural carriers are determined through an evaluation of the amount of work required to service their particular routes. Carriers with longer, more populated routes generally earned more than those with shorter routes that served fewer homes. Rural carriers also received an equipment maintenance allowance for the use of their automobiles. They work either a 5- or a 6-day week. For information on fringe benefits, see the statement on postal service occupations elsewhere in the *Handbook*.

Related Occupations

Although mail carriers play an important role in moving the Nation's mail, postal clerks and mailhandlers also provide necessary services, and their work and qualifications are closely related to those of mail carriers. Other related delivery occupations include messengers, merchandise deliverers, delivery-route truck drivers, 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 employment opportunities for mail carriers.

Telephone Operators

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. Often an operator is needed because a caller wants to reverse long-dis-



In many telephone company central offices, manual switchboards have been replaced with sophisticated computerized equipment.

tance charges, find out a telephone number in another city, or know the cost of a call. Operators also may be needed to contact the police or fire departments in an emergency or arrange a conference call 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 business 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 now operated by pushbuttons or dials.

Telephone company operators may be assigned either to handle long-distance calls or to give directory assistance. *Long-distance operators* (D.O.T. 235.462-010) obtain the information needed to complete the call, make the necessary connections, and record the details for billing. *Directory assistance operators* (D.O.T. 235.662-018) look up and provide telephone numbers. Service assistants train and help new operators to complete difficult calls.

PBX operators (D.O.T. 235.662-022) run switchboards for business offices 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 many small establishments, PBX operators work at switchboards that serve only a limited number of telephones. These operators may do other

office work such as typing or sorting mail and many also act as receptionists or information clerks. (The work of receptionists is described elsewhere in the *Handbook*.)

Working Conditions

Most telephone company and PBX operators work between 35 and 40 hours a week. Often, their scheduled hours are the same as those of other office clerical workers. 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 and on holidays and 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.

Operators usually work in pleasant, well-lit, air-conditioned surroundings. The job of a telephone operator requires little physical exertion; however, during the peak calling periods, the pace at the switchboard may be very hectic. Often operators are unable to leave their seats during these periods.

Places of Employment

About 310,000 telephone operators were employed in 1978. More than one-half worked as PBX operators in manufacturing plants, hospitals, department stores, or businesses. The remainder worked in telephone companies. About one-fourth of all operators work only part time.

Both telephone company and PBX operators are concentrated in heavily populated areas. Nearly one-fifth work in the New York City, Chicago, and Los Angeles metropolitan areas.

Training, Other Qualifications, and Advancement

Persons planning to become telephone operators should like to serve the public, be pleasant and courteous, and not mind sitting for long periods. A clear and pleasing voice and good hearing also are important. Many telephone companies and business firms require applicants, including operators, to pass a physical examination. High school courses in speech, office practices, and business math provide a helpful background for persons interested in this occupation.

New operators are taught on the job how to use the equipment and keep records of calls. Once they have learned the procedure, they put through practice calls. Instruction and practice usually last from 1 to 3 weeks. Operators then are assigned to regular operator jobs and receive further instruction from supervisors.

PBX operators who handle routine calls may have a somewhat shorter training period than telephone company operators. In large businesses, an instructor from the local telephone company may train new employees.

Experienced telephone company operators may be promoted to supervisory jobs or transfer to clerical occupations such as secretary or bookkeeper. They also may have the opportunity to advance to craft jobs such as telephone installers and repairers. PBX operators in large firms may advance to more responsible clerical positions; however, in many small businesses, opportunities for advancement usually are limited.

Employment Outlook

Employment of telephone and PBX operators as a group is expected to decline slightly through the 1980's. Nevertheless, thousands

of full-time and part-time workers will be hired each year to replace experienced operators who die, retire, or stop working for other reasons. Many other openings will result from the need to replace operators who advance to other occupations.

Employment of telephone company operators is expected to decline more than employment of PBX operators. As more telephone companies start charging customers for directory assistance and information calls, more people will dial numbers directly and use telephone directories to locate unknown numbers, thus reducing the need for operators. Also, technological improvements will limit the employment of operators. For example, more telephone companies are installing electronic switching systems in their central offices, thus reducing the need for manual switching of calls. In addition, traffic service position systems are being added, which 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 this information was tabulated by an operator and then transferred to the statement.

Even though more small businesses will require PBX services, employment growth of PBX operators will be limited as many large businesses convert to Central Exchange (CENTREX). With CENTREX, incoming and outgoing calls can be dialed directly without an operator's assistance.

Earnings

Telephone company operators in training averaged \$4.31 an hour in 1978; experienced operators, \$6.24; service assistants, \$7.25; and supervisors or chief operators, \$10.20. Contracts between unions and telephone companies generally provide for periodic pay

increases and extra pay for work on evenings, Sundays, and holidays. Earnings of experienced telephone operators are about the same as the average for all nonsupervisory workers in private industry, except farming.

Insurance, pension programs, holidays, vacations, and other benefits are much the same as those for other types of clerical employees. For specific information about benefits for telephone company operators, see the statement on the telephone industry elsewhere in the *Handbook*.

Many operators employed by telephone companies are members of the Communications Workers of America, the International Brotherhood of Electrical Workers, and the Telecommunications International Union.

Related Occupations

Other workers whose main activity consists of orally providing information and services to the general public include customer service representatives, dispatchers, hotel clerks, information clerks, police aides, receptionists, reservations agents, taxicab starters, and travel clerks.

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 operator jobs, write to:

Telecommunications International Union, P.O. Box 5462, Hamden, Conn. 16518.

United States Independent Telephone Association, 1801 K St. NW., Suite 1201, Washington, D.C. 20006.

EDUCATION AND RELATED OCCUPATIONS

The importance of an education has grown considerably since the birth of our Nation. Once primarily an agrarian economy, we have evolved into a highly sophisticated, technical, and urban society. Machinery and products never envisioned before are constantly being invented, calling for new jobs and skills to produce and use them. As a result, more educated workers are needed to

fill a variety of positions at all levels of society.

In addition, as our economy has prospered, it has allowed people more time for personal development and leisure. No longer required to labor from early morning until dusk, workers have sought new avenues for personal enrichment. Adult education and

craft courses, for example, draw increasingly larger numbers of interested students.

Teachers, teacher aides, and librarians play vital roles in the education of people of all ages. In large urban classrooms or rural county libraries, teachers and librarians are the people we turn to for information. These occupations are discussed in the following sections.

Teaching Occupations

Most people would agree that education is a life-long process. At every age we learn from our friends, family, and associates. We also teach others along the way, often unwittingly. But perhaps our most influential educational experiences occur during the years of formal education. During those years, students learn the skills to function in the world around them. They learn about their own interests and goals as they explore many subjects. They also make career decisions and train for productive work. Most significantly, they learn to think for themselves.

Today, about 3 million teachers are involved at all levels of this educational process. Teachers work with people of all ages in a variety of different subjects. Some teach youngsters in their first years away from home, while others work primarily with adults who are taking courses for recreation, personal fulfillment, or to increase their job-related skills. Some teachers are members of other professions and instruct part time.

Detailed information on teaching occupations and the outlook for teachers through the 1980's is presented in the following statements.

Kindergarten and Elementary School Teachers

(D.O.T. 092.227-010 and -014)

Nature of the Work

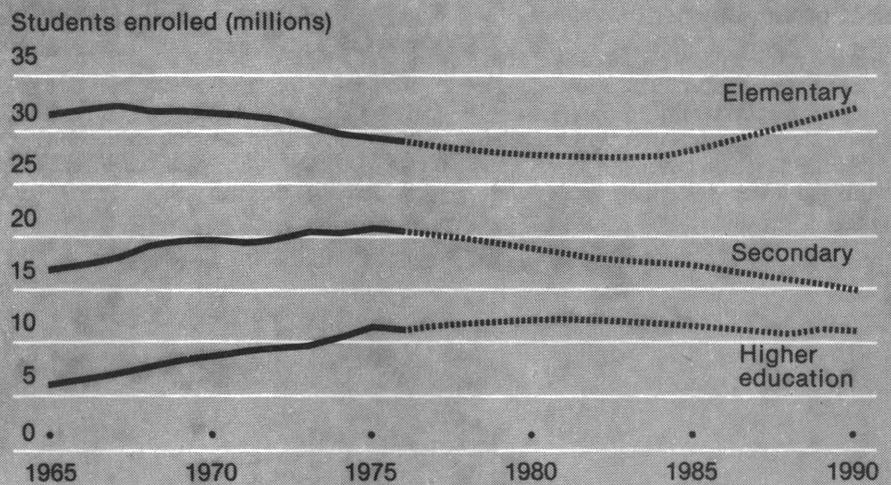
Kindergarten and elementary school teachers play a vital role in the development of children. What is learned or not learned in these early years can, to a large measure, shape students' views of themselves, the world, and the process of education.

Kindergarten and elementary school teachers must introduce children to the basic concepts of mathematics, language, science, and social studies to provide a sound foundation for more advanced study in the higher grades. They also try to instill good study and work habits and an appreciation for learning, while closely watching and evaluating each child's performance and potential.

Elementary school teachers often devise creative means to present specific subject matter. They may use films, slides, computers, or develop instructional games. They also arrange class trips, speakers, and class projects. All of this work takes much time and effort, often after the regular school day.

Teachers also are concerned with the so-

Changing enrollment levels will be the primary factor affecting employment of teachers



Sources: National Center for Education Statistics and Bureau of Labor Statistics

cial development and health of their students. 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 any possible health problems to parents and school health officials. The teacher's primary concern 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 teach basic subjects such as English, mathematics, or social studies.

Teachers participate in many activities outside the classroom. They generally must attend regularly scheduled faculty meetings and may serve on faculty committees, such as those to revise curricula, or to evaluate the school's objectives and the student's performance. Teachers also may supervise after school activities such as glee clubs, drama clubs, or arts and crafts classes. To stay up-to-date on educational materials and teaching techniques, they 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 secretarial work and help supervise lunch and playground activities. As a result, teachers can be free from routine duties to give more individual attention to students.

Working Conditions

In addition to hours spent with classes, teachers must spend time preparing lessons, grading papers, making reports, attending meetings, and supervising extracurricular activities. As a result, most teachers end up working well over 40 hours a week. Because the individual needs of each student put many demands on a teacher's time, teaching can be both physically and emotionally exhausting.

In addition to their regular assignments, some elementary school teachers teach summer sessions, take courses, or work at other jobs, such as camp counseling. Most elementary school teachers work a traditional 2-semester, 10-month school year. Some, however, work in year-round schools where they work 8-week sessions, are off 1 week between sessions, and have a longer midwinter break. This type of schedule may make finding additional employment outside the school system difficult.

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.

Employment in teaching is fairly steady.

Population trends rather than business conditions affect the market for teachers.

Most States have tenure laws—laws that ensure the jobs of teachers who have taught successfully for a certain number of years. In 25 States, tenure status is achieved automatically if the probationary period is completed and the teacher's contract has not been terminated. In States where tenure status is not achieved automatically, teachers who have completed a probationary period are required to negotiate a new contract.

Places of Employment

Over 1.3 million people worked as elementary school teachers in 1978. Most elementary school teachers work in public schools that have six grades; however, some teach in middle schools which cover the 3 or 4 years between the lower elementary grades and 4

years of high school. Only about 12 percent of elementary school teachers work in non-public 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 the department of education in the State in which they work. Some States also require teachers in private and parochial schools to be certified.

To qualify for certification, a teacher must have a bachelor's degree from an institution with an approved teacher education program. Besides a bachelor's degree, which provides the necessary liberal arts back-

ground, States require that prospective teachers have student-teaching and other education courses. In 1978, 23 States required teachers to have graduate degrees. However, this requirement was often coupled with provisions concerning continuing education.

Thirty States had continuing education requirements for teachers in 1978. Some States required U.S. citizenship; some an oath of allegiance; and several a health certificate. Only one State, Florida, had a residency requirement.

Local school systems sometimes have additional requirements for employment. Students should write to the local superintendent of schools and to the State department of education for information on specific requirements in the area where they want to teach.

In addition to meeting educational and certification requirements, 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 within a school system or transfer to another which recognizes experience and has a higher salary scale. Some teachers may advance to supervisory, administrative, or specialized positions. Often, however, these positions require additional training and certification. As a result, for most teachers, advancement consists of higher pay rather than more responsibility or a higher position.

Employment Outlook

Kindergarten and elementary school teachers may face competition for jobs of their choice through the 1980's. If the pattern continues in line with past trends, the number of persons qualified to teach in elementary schools will approximate the number of openings.

The basic sources of teacher supply are recent college graduates qualified to teach at the elementary level and teachers seeking reentry to the profession. Reentrants, although more experienced, will face increasing competition from new graduates, who command lower salaries and have more recent training.

Pupil enrollment is the basic factor underlying the need for teachers. Because of fewer births in the 1960's, elementary enrollments have been on the decline since 1967, when they peaked at nearly 32 million. The National Center for Education Statistics projects that, by 1983, the downward enrollment trend will halt at a level of 27 million. Thereafter, enrollments will advance to nearly 32 million by 1990.

Teachers will be needed to fill new positions created by larger enrollments; to replace those who are not now certified; to



Teachers often must give students individual attention.

meet the expected pressure for an improved pupil-teacher ratio; and to fill positions vacated by teachers who retire, die, or leave the profession for other reasons.

A decline in the projected number of children born over the next decade could lessen the demand for teachers. While the trend has not been clearly established, since 1970 women have continued to have fewer children, and according to a recent survey, they expect to continue having smaller families than were common 10 years ago. However, the number of births is expected to rise as a result of the growing number of women entering the childbearing years.

Several factors could alter the outlook for teachers. Increased emphasis on early childhood education, on special programs for disadvantaged children, and on individual instruction may result in larger enrollments, smaller student-teacher ratios, and consequently an increased need for teachers. Possible budget constraints, on the other hand, might limit expansion of educational services.

Earnings

According to the National Education Association, public elementary school teachers averaged \$14,669 a year in 1978-79. Average earnings in 1978 were about one and one-third times the average earnings for all non-supervisory workers in private industry, except farming. Generally, States in the Northeast and in the West paid the highest salaries.

Collective bargaining agreements cover an increasingly large number of teachers. In 1978, 31 States had enacted laws that required collective bargaining in teacher contract negotiations. 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, recordkeeping expertise, creativity, and leadership ability. Other occupations that make use of some or all of these aptitudes include administrative officers; child care attendants; education and training managers for government or private industry; employment interviewers; encyclopedia research workers; lawyers; librarians; newswriters; personnel managers; public relations representatives; records managers; sales representatives; social workers; and career, vocational, or school counselors.

Sources of Additional Information

Information on schools and certification requirements is available from local school

systems and State departments of education.

For information on the Teacher Corps, contact:

Teacher Corps, U.S. Department of Education, 400 Maryland Ave. SW., Washington, D.C. 20202.

Other sources of general information are:

American Federation of Teachers, 11 Dupont Circle, Fifth Floor, Washington, D.C. 20036.

National Education Association, 1201 16th St. NW., Washington, D.C. 20036.

Secondary School Teachers

(D.O.T. 091. except -107)

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. It is also a time of preparation for their future lives as citizens and jobholders. Secondary school teachers have a direct role in this process.

The primary function of the secondary school teacher is to instruct students in a specific subject, such as English, 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 other activities, such as a class project to devise an urban redevelopment plan for the city.

Teachers also must 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.

Teachers use a variety of instructional materials including films, slides, and computer terminals. They also may arrange for speakers or trips to supplement their classroom lectures, such as a visit to the planetarium after a discussion of the earth's rotation.

Some teachers teach courses, such as welding, auto mechanics, or distributive education, which train students for specific jobs after graduation. These teachers instruct with the actual tools of the trade, whether they be adding machines or an 8-cylinder car engine.

Secondary school teachers also supervise study halls and homerooms, and attend

meetings with parents and school personnel. Often they work with student groups outside of class to help solve specific problems. Teachers also participate in workshops and college classes to keep up-to-date on their subject specialty and on current trends in education.

In recent years, teachers have been able to spend more time teaching due to the increased availability of teacher aides who perform secretarial work, grade papers, and do other routine tasks.

Working Conditions

In addition to hours spent with their classes, teachers must spend time preparing lessons, grading papers, making reports, attending meetings, and supervising extracurricular activities. As a result, most teachers end up working 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.

The District of Columbia and most States have tenure laws—laws that ensure the jobs of teachers who have taught successfully for a certain number of years. In 25 States, tenure status is achieved automatically if the probationary period is completed and the teacher's contract has not been terminated. In States where tenure status is not achieved automatically, teachers who have completed a probationary period are required to negotiate a new contract.

Places of Employment

In 1978, more than 1 million teachers taught in secondary schools. More than 90 percent of them taught in public schools. Although they work in all parts of the country, teachers are concentrated in cities and in suburban areas.

According to a recent survey, slightly more than one-half of all public secondary school teachers teach in senior high schools; about one-third teach at the junior high level. About one-tenth teach in junior-senior high schools, and a very small number are elementary-secondary combination teachers.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require public secondary school teachers to be certified. Many States also require certification of secondary teachers in private and parochial schools.

In 1978, 23 States required graduate degrees for initial certification. However, this

requirement was often coupled with provisions concerning continuing education. Thirty States required continuing education of teachers in 1978.

The educational requirements for secondary school teachers vary by State and by school system. Approved colleges and universities in every State offer programs that include the education courses and the student-teaching that States require. They also offer the academic courses that are necessary to qualify teachers in the various subject specialties taught at the secondary level.

States and local jurisdictions often have general requirements for teachers, such as the recommendation of the college, a certificate of health, and U.S. citizenship. Prospective teachers may get complete information on educational and general requirements from each State department of education and from the superintendent of schools in each community.

Aside from educational requirements, a secondary school teacher must want to work with young people, have an interest in a special subject, and have the ability to motivate students and to relate knowledge to them.

Education and experience provide the primary basis for advancement, usually in the form of higher salaries rather than a different job. Advancement to supervisory and administrative positions usually requires at least 1 year of professional education beyond the bachelor's degree and several years of successful classroom teaching. Only a small proportion of secondary school teachers, however, advance to administrative positions.

Some experienced teachers with specific preparation may work as special school service personnel, such as school psychologists, reading specialists, or guidance counselors. Often these jobs require special certification as well as special education.

Employment Outlook

The supply of secondary school teachers through the 1980's will greatly exceed anticipated requirements, if past trends continue. As a result, prospective teachers are likely to face keen competition for jobs.

The prime sources of teacher supply are recent college graduates qualified to teach secondary school and teachers seeking to re-enter 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.

Pupil enrollment is the basic factor underlying the demand for teachers. The National Center for Education Statistics projects that enrollment in secondary schools will decline and, in turn, reduce the demand for teachers. As a result, over the 1978-90 period, nearly all teaching positions will stem from the need to replace teachers who die, retire, or leave the profession for other reasons. Thus, an

increasing proportion of prospective teachers will have to consider alternatives to secondary school teaching.

Although the overall outlook for secondary teachers indicates a highly competitive market, employment conditions may be more favorable in certain fields. Education of the gifted and talented, special and vocational education, mathematics, natural sciences, and physical sciences should not experience as large an oversupply as some other subjects.

Earnings

According to the National Education Association, public secondary school teachers averaged \$15,474 per year in 1979. This is one and one-half times the average for non-supervisory workers in private industry, except farming. Generally, salaries were higher in the Northeast and in the West than they were in the Southeast and in the Midwestern States.

Collective bargaining agreements cover an increasingly large number of teachers. In 1978, 31 States had enacted laws that required collective bargaining in teacher contract negotiations.

In some schools, teachers receive supplementary pay for such school-related activities as coaching sports and working with students in extracurricular activities, such as music, dramatics, or school publications.

Some public school teachers also work in their school systems during the summer. 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; recordkeeping expertise; creativity; helpfulness; and leadership ability. Other occupations which make use of some or all of these aptitudes include: Administrative officers; career, vocational, or school counselors; education and training managers for government or private industry; employment interviewers; encyclopedia research workers; lawyers; librarians; newswriters; personnel managers; public relations representatives; records managers; sales representatives; and social workers. Other related occupations include those in the particular subject field in which the teacher is trained.

Sources of Additional Information

Information on schools and certification requirements is available from local school systems and State departments of education.

For information on the Teacher Corps, contact:



In addition to hours spent in the classroom, teachers must spend time preparing lessons, grading papers, and supervising extracurricular activities.

Other sources of general information are:

American Federation of Teachers, 11 Dupont Circle, Fifth Floor, Washington, D.C. 20036.

National Education Association, 1201 16th St. NW., Washington, D.C. 20036.

College and University Faculty

(D.O.T. 090.227-010)

Nature of the Work

Each year thousands of Americans enter college. People attend college for a variety of reasons. Some view it primarily as an opportunity for personal enrichment. Many others seek higher education to obtain the skills they need for a job. To meet all these needs, colleges and universities hire faculty to provide instruction in many different subjects.

The primary function of the college or university faculty member is to present an in-depth analysis of a particular field of study. 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 usually is stressed more at major colleges and universities than at junior and community colleges. A recent survey indicated that as many as one-fourth of the faculty in science and engineering departments that offered doctoral degrees were primarily involved in research and development activities.



In addition to teaching, many college teachers participate in professional activities and research.

In addition to time spent on preparation, instruction, evaluation, 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. Those who are department chairpersons have supervisory and administrative duties.

Working Conditions

College faculty members generally have flexible schedules, dividing their time among teaching, research, and administrative responsibilities. The normal teaching load usually is heavier in junior 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). Over three-fifths of those faculty members are tenured. Under a tenure system, a faculty member usually receives 1-year contracts during a probationary 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. Some colleges and universities are turning more and more to short-term contracts and to part-time faculty members to save money and avoid long-term commitments.

Few professions offer vacation arrangements as attractive as those in college teaching. In addition to summer months during

which faculty members may work, travel, study, 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.

Places of Employment

In 1978, about 673,000 faculty members worked in about 3,200 colleges and universities. An estimated 441,000 faculty members were full-time senior staff; about 204,000 were part-time senior staff; and 28,000 were full-time junior instructors. In addition, there were thousands of part-time assistant instructors, teaching fellows, teaching assistants, or laboratory assistants who aided these faculty members while studying for their advanced degrees.

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 over 90 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.

Training, Other Qualifications, and Advancement

The overwhelming majority of full-time college and university faculty are classified in four academic ranks: Instructors, assistant professors, associate professors, and professors. The top three ranks comprise about

three-fourths of full-time faculty. A small proportion of faculty are classified as lecturers. Most full-time junior and community college faculty are in institutions that do not use academic ranks.

Most college faculty enter the profession as instructors and must have at least a master's degree. Because competition for positions is so keen, however, some colleges and universities consider only doctoral degree holders for entry level academic appointments.

Doctoral programs usually require 3-5 years of study beyond the bachelor's degree, including intensive research for a doctoral dissertation which makes an original contribution to the candidate's field of study. A working knowledge of one or more foreign languages and in scientific fields, advanced mathematical and statistical techniques, often is required as well. Students should carefully consider 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.

A special zeal for learning and the desire and skill to help others learn are necessary for success. College faculty must have inquiring, analytical minds in order to devote their lives to the pursuit and dissemination of knowledge. Since they function both as teachers and researchers, they must be good at communicating information and ideas both orally and in writing. As models for their students, they must 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.

Employment 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. In

recent years, a growing number of adults have entered college. Although the outlook for college enrollments during the 1980's is uncertain, they are likely to decline. Compared to the recent past, there will be many fewer people of college age, and enrollments by adults are not expected to make up the difference. Fewer students during the 1980's almost certainly would mean some decrease in employment of college faculty over the period.

As a result, job openings for college faculty 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 appointments that offer little or no hope of gaining tenure.

Preference for faculty candidates with a doctorate will continue to be much stronger in 4-year institutions than in 2-year institutions. Because of possible enrollment declines and budgetary constraints, however, some 4-year institutions may find it more economical to hire some new faculty members at the master's degree level. At 2-year institutions, the education and training required for attainment of the doctorate often is not considered advantageous for a person whose primary task will be teaching undergraduates.

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 average higher salaries than those in 2-year schools. According to a 1977-78 survey, salaries for all full-time faculty on 9-month contracts averaged around \$18,700; professors, \$25,100; associate professors, \$19,000; assistant professors, \$15,500; and instructors, \$12,500.

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 almost 90 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.

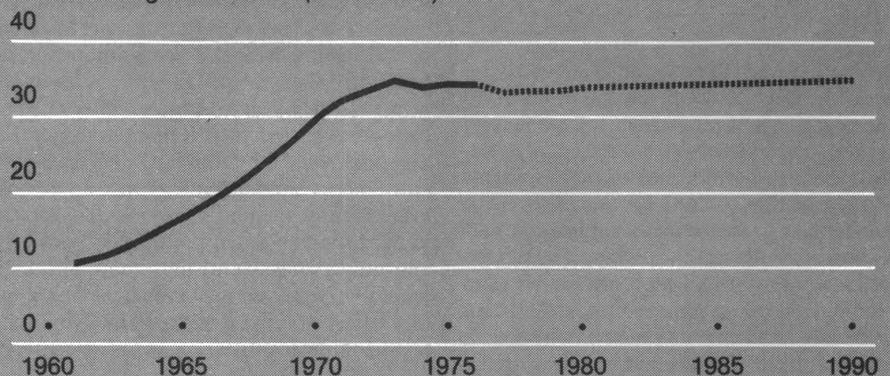
Some college and university faculty members also may enjoy certain benefits offered by few other professions, including tuition waivers for dependents, housing allowances, travel allowances, and paid leaves of absence. In many institutions, faculty members are eligible for a sabbatical leave after 6 or 7 years of employment.

Related Occupations

College and university faculty assist students in their academic pursuits. Others who assist college students in a variety of ways

The continuing oversupply of doctoral degree holders will create very stiff competition for academic positions

Doctoral degrees earned (thousands)



Source: National Center for Education Statistics

and whose jobs generally require advanced training include college presidents, deans of students, academic deans, directors of admissions, directors of athletics, financial aid officers, foreign student advisors, college student personnel workers, college career planning and placement counselors, and academic librarians.

Sources of Additional Information

General information on teaching as a career is available from:

American Federation of Teachers, 11 Dupont Circle NW., Washington, D.C. 20036.

Professional societies in the various subject fields will generally provide information on teaching requirements and employment opportunities in their particular fields. Names and addresses of societies are given in the statements on specific professions elsewhere in the *Handbook*.

Teacher Aides

(D.O.T. 099.327, 249-367-074)

Nature of the Work

Teacher aides free teachers from routine tasks that persons without extensive training in teaching can handle. They support teachers directly in work involved with teaching students and, indirectly, in nonteaching activities. Aides may work in the classroom under the teacher's supervision or have duties assigned outside the learning environment.

Aides' responsibilities vary greatly by school district. In some areas, 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, for example, or help another find information needed for a report, or watch a third practice or 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 areas, teacher aides primarily handle many of the routine tasks that otherwise would be left to the teacher. They may grade tests and papers, check homework, and keep health and attendance records. Also, secretarial duties such as typing, filing, and duplicating materials for the teacher's use may be part of the aide's job. Sometimes, the duties of teacher aides include stocking supplies, preparing materials for use by students, and operating audiovisual equipment. They also may supervise students during lunch and recreation periods and school bus loading and help keep the classroom in order.

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.

Places of Employment

In 1978, about 342,000 persons worked as teacher aides. While aides work in both elementary and secondary schools, they are concentrated in the early grades. Large city schools or schools in metropolitan areas surrounding large cities employ a large proportion of aides. Schools with large enrollments are more likely than small schools to employ teacher aides, and they more often hire them on a full-time, regular basis.

Training, Other Qualifications, and Advancement

Training requirements for teacher aides vary widely. Some schools hire beginning aides with a high school diploma; some do not require even a high school education. Other employers may want aides to have some college training or a bachelor's degree. Areas that delegate a significant amount of classroom responsibility to aides usually require more training than those districts which primarily assign aides to clerical or monitor jobs.

Teacher aides may receive their training for classroom work in a preservice program or on the job. A growing number of junior and community colleges offer teacher aide programs. Upon completion of one of these programs, the student is awarded an associate degree and is prepared to work directly in the classroom. In 1978, there were about 400 such programs.

In training programs, teacher aides learn how to help the classroom teacher work with students. Aides are taught to operate audiovisual equipment, administer first aid, and handle recordkeeping activities. They also learn to make charts and other instructional materials and practice techniques for making bulletin boards and working with other art media. In addition, teacher aides 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



In some areas, teachers aides work directly in the instruction of children.

skills and be able to communicate effectively with students and teachers. Clerical skills may be necessary also.

Some schools have regulations regarding the hiring of teacher aides. Applicants may be required to have a family income below a certain level or to be a parent of children in the school district. Sometimes, persons living in the school community are given preference in hiring. In addition, health regulations may require that teacher aides pass a physical examination. Thirty-two States either require or authorize teacher aides to have teacher-aide certification. In other areas, the city or county board of education may set standards for employment of aides. The local superintendent of schools and the State department of education can provide information on specific requirements for employment in a particular area.

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.

Employment Outlook

Employment of teacher aides is expected to increase much faster than the average for all occupations through the 1980's. If past trends continue, the proportion of teacher aides in relation to teachers being hired is expected to increase. Actual job prospects, however, will vary by district. Budget constraints may adversely affect demand for these workers in some areas, while other districts, unable to afford additional more highly paid teachers, may hire aides to lessen teachers' clerical duties. In addition, more aides will be needed to fill openings as workers die, retire, or transfer to other occupations.

Earnings

In 1978-79, teacher aides involved in teaching activities earned an average of \$3.70 an hour, with the majority earning between \$3 and \$4.25 an hour. Those performing nonteaching activities averaged \$3.50 an hour, with most earning between \$2.75 and \$4 an hour. Earnings varied by

region and also by the work experience and academic qualifications of the aide. Most aides, usually those covered by collective bargaining agreements, have health and welfare 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, guides, home health aides, library attendants, medical records technicians, nurse aides, receptionists, records custodians, and retail sales clerks.

Sources of Additional Information

Additional information on teacher aides may be obtained from:

National Education Association, 1201 16th St. NW., Washington, D.C. 20036.

American Federation of Teachers, 11 Dupont Circle, Fifth Floor, Washington, D.C. 20036.

Library Occupations

Libraries came into being in response to the need for access to recorded knowledge. As the volume of materials grows, the task of acquiring, organizing, and providing access to them becomes more and more complex. Information now takes many forms—books, periodicals, microfilms, slides, cassettes, motion pictures, recordings, and computer tapes, to name a few.

Four distinct kinds of libraries have evolved: Public libraries, school libraries, college and university libraries, and special libraries.

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 such a large part of their collection is usually in nonprint form, have become an integral part of the elementary and secondary school educational experience.

College and university libraries have a dual role of providing reference collections for college students and supporting the highly specialized research conducted in the academic setting.

Contributing to the evolution in the special library field are advances in science and technology and an emphasis on information and documentation as the basis for decisionmaking. Special libraries, which tailor their services to a single group of users—lawyers, physicians, or engineers, for example—are found in government agencies, law offices, hospitals and medical centers, scientific research laboratories, banks and other financial institutions, museums and art collections, historical societies, and industrial firms of all kinds.

Librarians and library support staff take care of recorded knowledge and help users find needed information. The growing complexity of the field demands that the library staff have specialized knowledge. Computer technology, for example, is integral to the operation of more and more libraries, and increasingly, librarians must be able to use automated systems or equipment.

Information-handling skills are in demand both in libraries and in other settings. Today's volume of documentation and recordkeeping, combined with new possibilities in information-handling by computers, has produced a growing demand for appropriately trained librarians outside the traditional setting. New roles are emerging particularly in the rapidly developing commercial “infor-

mation industry” that could enlarge opportunities for library school graduates in the future.

The following statements describe the work of librarians and library technicians and assistants in greater detail, and discuss training requirements and job prospects in these occupations.

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 areas: user services and technical services. Librarians in user services—for example, reference and children's librarians—work directly with the public helping them find the information they need. Librarians in technical services—such as acquisitions librarians—are primarily concerned with acquiring and preparing materials for use and deal less frequently with the public.

The size of the library affects the scope of a librarian's job. In small libraries, librarians generally handle both user and technical services. They select, purchase, and process library 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 work in a single area, such as acquisitions, cataloging, bibliography, reference, circulation, or administration. Or they may handle special collections.

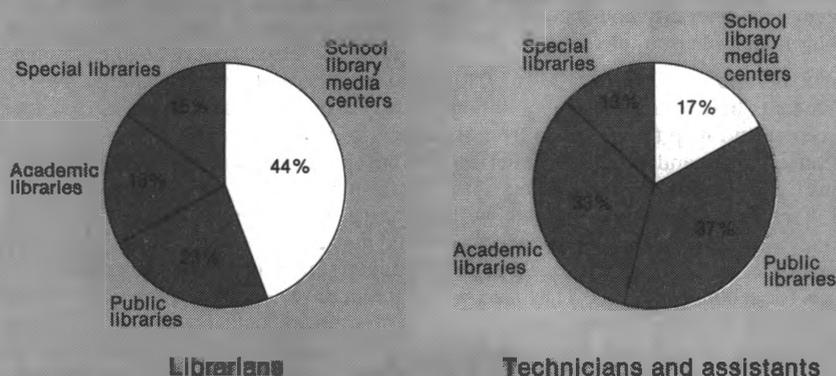
Building and maintaining a strong collection is essential in any library, large or small. *Acquisitions librarians* (D.O.T. 100.267-010) select and order books, periodicals, films, and other materials that suit users' needs. To keep abreast of current literature, they read book reviews, look over publishers' 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 library materials have been received, other librarians prepare them for use. *Classifiers* (D.O.T. 100.367-014) classify library materials by subject matter. They may skim through a book quickly to be sure what it is about, then assign a classification number. *Catalogers* (D.O.T. 100.387-010) then supervise assistants who prepare cards that indicate the book's title, author, subject, publisher, and date of publication. The cards are then filed in the card catalog.

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

Almost half of all librarians, but only one-sixth of all technicians and assistants, work in school library media centers

Employment, 1978



Source: Bureau of Labor Statistics

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 to inform scholars about important additions to the collection.

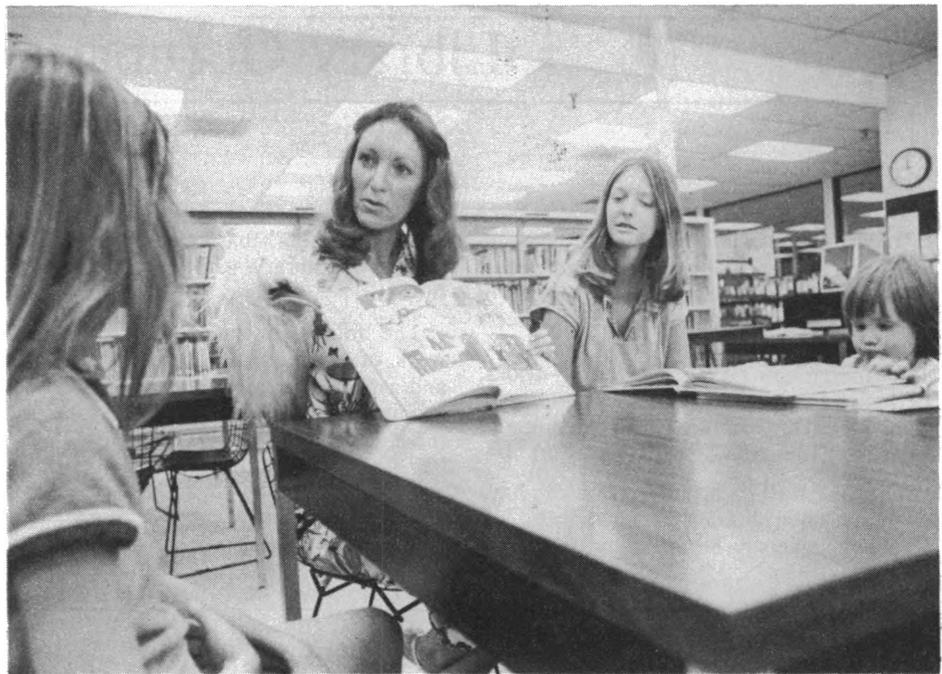
Librarians are also classified according to the type of library in which they work: Public libraries, school library media centers, academic libraries, and special libraries.

Public librarians serve people of all ages and from all walks of life. Increasingly, public librarians provide special materials and services to culturally and educationally deprived persons, and to persons who, because of physical handicaps, cannot use conventional print.

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 areas such as acquisitions, cataloging, and special collections.

Some public librarians work with specific groups of readers. *Children's librarians* (D.O.T. 100.167-018) serve young people by finding books 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 books 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) teach students how to use the school library media center and help them choose from its collection of print and nonprint materials. Working with teachers and supervisors, 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 the library's materials. Increasingly, the school library media center is viewed as an integral part of the school's overall instructional program, and



Children's librarians often conduct special programs such as story hours for youngsters.

many school librarians work closely with classroom teachers. They assist teachers in developing units of study or independent study programs and participate in team teaching.

Very large high schools may employ several school librarians, each responsible for a particular aspect of the library program or for a special subject area. *Media specialists* and *audiovisual librarians*, for example, develop audiovisual programs to be included in or to supplement the curriculum. They also may develop 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 libraries maintained by government agencies and by commercial and industrial firms, such as pharmaceutical companies, banks, law firms, advertising agencies, medical centers, and research laboratories. They provide materials and services covering subjects of special interest to the organization. They build and arrange the organization's information resources to suit the needs of the library users. Special librarians assist users and 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 com-

puter'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 science specialists*. Although they work closely with special librarians, information science specialists 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 programing techniques for computerized information storage and retrieval systems, design information networks, and develop microfilm technology.

Working Conditions

Librarians should enjoy working with data as well as people. To make decisions about library matters without supervision, they need to be responsible and thoughtful. Physically, the job may require much standing, stooping, bending, and reaching.

Librarians typically work a 5-day, 35-40 hour week. Public and college librarians may work some weekends and evenings. School librarians generally have the same workday schedule as classroom teachers. A 40-hour week during normal business hours is common for government and other special librarians.

Places of Employment

An estimated 142,000 professional librarians were employed in 1978. School librarians accounted for more than two-fifths of all librarians. Public librarians accounted for almost one-fourth of the total, while colleges and universities employed about one-sixth.

Another sixth worked in special libraries, including those in private industry, in government agencies, and in institutions such as hospitals and correctional facilities. A small number served as consultants, as State and Federal Government administrators, and as faculty in schools of library science. In late 1977, the Federal Government employed about 3,300 professional librarians.

Most librarians work in cities and towns. Those attached to bookmobile units serve widely scattered population groups.

Training, Other Qualifications, and Advancement

In most cases, a master's degree in library science is necessary to obtain a job as a librarian. Although about 120 schools offered such degrees in 1977, most employers prefer graduates from one of the 67 library schools accredited by the American Library Association. Public school libraries in the State in which the librarian has received training may be an exception, since most States have their own certification requirements for public school librarians.

Most graduate schools of library science require graduation from an accredited 4-year college or university and a good undergraduate record. In addition, some schools require a reading knowledge of at least one foreign language. Some schools also require introductory undergraduate courses in library science. Many prefer a liberal arts background with a major in an area such as the social sciences, the arts, or literature. Some schools require entrance examinations.

A typical graduate program in library science includes basic courses in information storage and retrieval, reference tools and serving the user, materials selection, and the foundations of librarianship. Also included are advanced courses in resources, including resources for special groups such as children or young adults; in the administrative aspects of librarianship; in technical areas such as cataloging, indexing, and abstracting; and in library automation. As automation becomes increasingly important, many library schools encourage students to take courses in computer and information science.

Although the master's of library science (M.L.S.) program represents a general, all-round preparation for library work, some people specialize in a particular area such as archives, media, or children's literature. A few M.L.S. degree holders return to school to receive a certificate of advanced study. For those interested in the special libraries field, a master's degree or doctorate in the library's specialization is highly desirable.

Most States require that public school librarians be certified and trained both as teachers and librarians. They also may require that media specialists, for example, specialize in media within the M.L.S. program. Some States require certification of public librarians employed in areas such as municipal, county, or regional library systems. The

specific education and experience necessary for certification vary according to State and the school district. The local superintendent of schools and the State department of education can provide information about specific requirements in an area.

In the Federal Government, 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.

Under cooperative work-study programs, library schools combine the academic program with practical work experience in a library. Scholarships for training in library science are available under certain State and Federal programs, from library schools, and from a number of the large libraries and library associations. Loans, assistantships, and financial aid also are available.

Many employers 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 second master's degree in business or public administration may help to obtain such positions. A Ph.D. degree in library science is advantageous for a teaching career in library schools or for a top administrative post, particularly in a college or university library or in a large library system.

Employment Outlook

The employment outlook for librarians is expected to remain very competitive through the 1980's. Although library school enrollments are expected to decline, the number of new graduates and labor force reentrants seeking jobs probably will exceed openings. Most job openings in libraries during the 1980's will result from replacement needs.

Employment growth in public libraries is likely to be slower than it has been during the last two decades. Faced with escalating materials costs and tighter operating budgets, many libraries are expected to increase their use of support staff and volunteers, which will slow employment growth for librarians.

Virtually no growth is foreseen for academic librarians, 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, very modest growth is foreseen. Elementary and secondary enrollments are expected to remain relatively stable through the 1980's.

Opportunities will be best for librarians with scientific and technical backgrounds,

particularly in private libraries in the health sciences. The expanding use of computers to store information and to handle routine operations such as ordering and cataloging will sustain the demand for information and automation specialists.

The development of new information handling jobs outside the traditional library setting is also expected to offer employment opportunities for imaginative librarians who can persuade prospective employers in government and private industry of the need for their services.

Persons who are geographically mobile will face better employment prospects than those limited to one area.

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 \$11,894 a year in 1977, and ranged from \$10,929 in public libraries to \$12,194 in school libraries. The median salary for librarians in college and university libraries was \$16,930 in 1978. Average salaries ranged from \$12,871 a year for those with less than 5 years of experience to over \$38,700 for directors of libraries. In general, librarians earned twice as much as the average for all nonsupervisory workers in private industry, except farming. Librarians in the Federal Government averaged about \$21,900 in 1978.

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 communication of 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, publisher's 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.

Information on Federal assistance for graduate school library training under the Higher Education Act of 1965 is available from:

Office of Libraries and Learning Resources, Office of Education, U.S. Department of Education, Washington, D.C. 20202.

Those interested in a career in Federal libraries should write to:

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

Material about a career in information science may be obtained from:

American Society for Information Science, 1110 16th St., NW., Washington, D.C. 20036.

Information on graduate schools of library and information science can also be obtained from:

Association of American Library Schools, 471 Park Lane, State College, Pa. 16801.

Individual State library agencies can furnish information on scholarships available through their offices, requirements for certification, and general information about career prospects in their regions. State boards of education can furnish information on certification requirements and job opportunities for school librarians.

Library Technicians and Assistants

(D.O.T. 100.367-018; 109.137-010; 222.367-026; and 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 aid professional librarians in acquiring, organizing, and making material accessible to users. Like librarians, technicians and assistants work either in technical or user services. Technicians usually need more training than library assistants because their duties are more responsible and less clerical in nature.

Library technicians (D.O.T. 100.367-018) are also known as *library technical assistants*. They may answer questions about the proper use of the card catalog, direct library users to standard references, perform routine descriptive cataloging, file cards in catalog drawers, verify information on order requests, or supervise library clerks in the acquisitions or other departments. 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 help retrieve information from a computerized data base. Technicians sometimes work on special projects. A technician with artistic ability, for example, might design posters and displays for a school library media center.

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 aides*, *library attendants*, 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 should enjoy working with books, numbers, and people. At times their jobs may be very repetitive, when calculating circulation statistics, for example. At other times, however, they may work on various special projects such as setting up displays. Physically, the job may require much standing, stooping, bending, and reaching.

Library technicians and assistants in government and special libraries 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.

Places of Employment

In 1978, an estimated 172,000 library technicians and assistants worked in libraries of every description; small libraries employed just 1 or 2 support personnel, while very large libraries employed hundreds.

In late 1977, the Federal Government employed about 3,600 library technicians. These people worked chiefly in the Department of Defense and the Library of Congress, although some worked in small Federal libraries throughout the country.

Training, Other Qualifications, and Advancement

Libraries vary a great deal in the background they prefer for support staff. The local job market plays an important role, too. A high school diploma is the usual requirement for a library assistant. However, libraries may hire persons who have not completed high school to work as pages; these workers retrieve books from closed stacks and shelve returns. As in most clerical occupations, typing ability is helpful. Some academic libraries require library assistants to have at least a bachelor's degree.

Completion of high school often is sufficient for a job as a library technician. Because the work involves the exercise of judgment about library procedures, however, job applicants must be able to demonstrate suitable potential. Previous work experience—especially in a library—or some college education may be regarded as evidence of an applicant's ability to learn the job. Although duties vary from library to library, some post-high school education is increasingly important for technicians in libraries where fiscal con-

siderations have resulted in greater responsibility for support staff.

Most library technicians are trained on the job. Some complete formal programs in library technology, although this is not usually a prerequisite for hiring. Many libraries encourage support staff members to take courses in library technology to improve their job skills, however.

In 1977, over 180 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 a year of library-related study. Students study the purposes and organization of libraries, and the procedures and processes involved in their operation. They learn to order and process, catalog, and circulate library materials. Some receive training in library automation. Many learn to use and maintain audiovisual materials and equipment.

Some programs teach skills for a particular type of library or a specific skill such as audiovisual technology. Therefore, a prospective student should select a program with a knowledge of the curriculum, instructional facilities, faculty qualifications, and the kinds of jobs that graduates have found. Also, applicants should be aware that, while programs may lead to an associate degree, credits earned in a library technology program do not apply toward a professional degree in library science.

A high school diploma or its equivalent is the standard requirement for both academic and on-the-job training programs. Many programs also require typing.

Employment Outlook

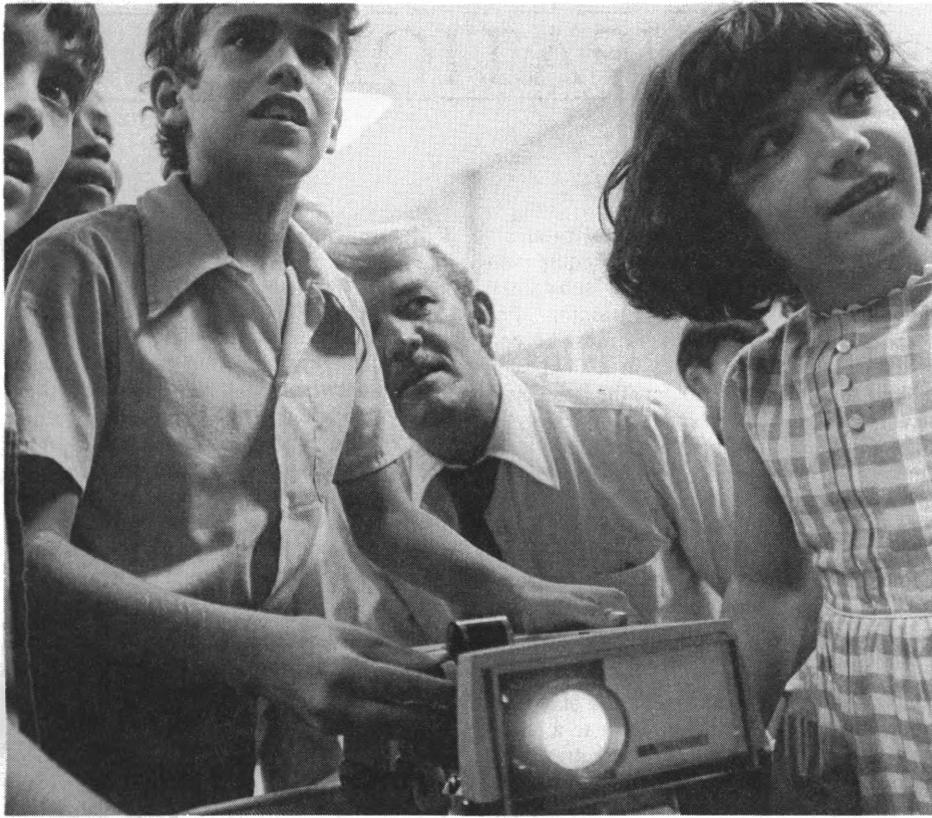
The number of library technicians and assistants is expected to grow about as fast as the average for all occupations through the 1980's. The expansion of library services and the growth in population will be the main factors affecting demand for library assistants and technicians. In addition, technicians and assistants increasingly will perform some of the routine tasks formerly done by librarians.

In addition to openings created by growth, many library technicians and assistants will be needed annually to replace those who die, retire, or transfer to other fields.

Earnings

Salaries for library technicians and assistants vary widely depending on the size of the library or library system in which they work as well as the geographic location and size of the community. However, in general, they averaged about the same as all nonsupervisory workers in private industry, except farming.

Salaries of library technicians in the Federal Government averaged \$12,100 in 1978.



Operating audio visual equipment is often a major part of the library technician's job.

Most libraries provide fringe benefits such as group insurance and retirement pay. Additional benefits offered by private businesses often include educational assistance programs. Library technicians employed by the Federal Government receive the same benefits as other Federal workers.

Related Occupations

Library technicians and assistants aid librarians by keeping records, cataloging, sorting and shelving materials, and assisting library users. Related occupations include 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, Cuyahoga Community College, 2900 Community College Ave., Cleveland, Ohio 44115.

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.

SALES OCCUPATIONS

Sales work offers a wide range of career opportunities. Many sales jobs are open to high school graduates; some, however, require a college degree. Sales offers opportunities to people who want to be their own bosses and determine their own schedules; often, these people enjoy the challenge and risk of having their earnings depend entirely upon their success in selling. Other more routine sales jobs have structured work schedules and regular pay. In all kinds of sales work, opportunities are good for flexible or part-time working hours. In 1978, almost 6 million people, or about 6 percent of all workers, were in sales occupations. More than 25 percent worked part time.

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, automobile service advisors, gasoline service attendants, models, travel agents, and route drivers.

Training, Other Qualifications, and Advancement

Training requirements for sales work are as varied as the work itself. Sales workers who sell standardized merchandise such as magazines, candy, cigarettes, and cosmetics usually are trained on the job by experienced sales clerks; in some large stores, they may attend brief training courses. The

sales worker who sells complex products or services, such as electronic equipment or liability insurance, needs a substantial amount of education and training. For some positions, sales workers must be college graduates with majors in a field such as engineering. Others get the necessary technical knowledge from university or manufacturers' courses. Still others learn through years of on-the-job experience, often supplemented by home study. Thus, a real estate agent may take university extension courses; a department store beauty counselor may participate in an industry-sponsored training program; or a jewelry sales worker may learn through years of observation and study 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.

Personal attributes are extremely important in sales occupations—more so than in many other kinds of work. Sales workers must be outgoing. They have to be poised and at ease with strangers, good at striking up a conversation, and relating to other people. Other important attributes for selling are initiative, energy, self-confidence, imagination, and self-discipline. Arithmetic skills are an asset.

Employment Outlook

Employment in 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 of the industries in which sales persons work, thousands of openings will occur each year as workers die, retire, or leave the occupation for other reasons. As the accompanying chart indicates, retail trade will offer the greatest number of openings. Many part-time jobs will be available, for example, in shopping centers that are open at night.

More detailed information about employment prospects in sales work is given in the statements that follow.

Automobile Parts Counter Workers

(D.O.T. 279.357-062)

Nature of the Work

Periodically, automobile parts must be replaced to keep the vehicle in proper working condition. Selling these replacement parts as well as accessories for cars, vans, trucks, and other motor vehicles is the job of the automobile parts counter worker.

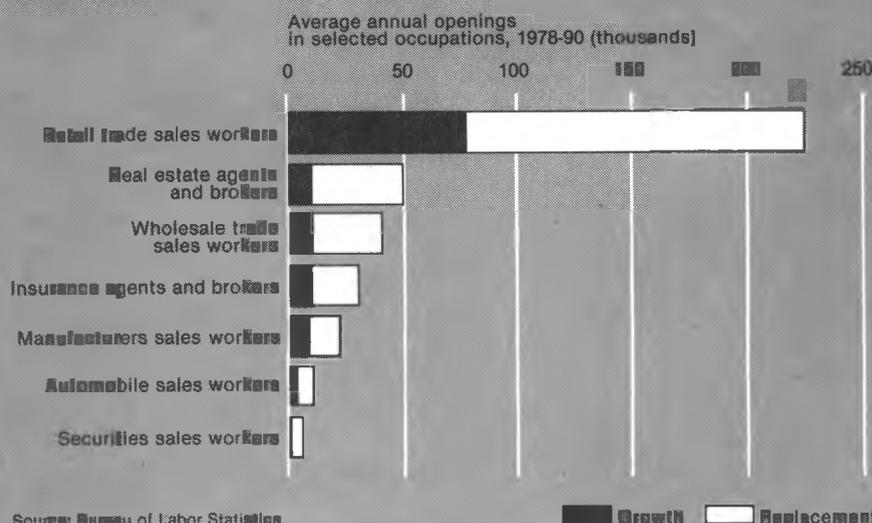
Most automobile parts counter workers are employed in wholesale and retail automobile parts stores and automobile dealerships. Those in wholesale and retail parts stores sell parts for many makes and models of vehicles. Their customers include independent repair shops, service stations, self-employed mechanics, and "do-it-yourselfers." Counter workers employed in dealerships handle parts for the makes of vehicles sold by the dealers they work for 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 they have obtained the parts the customers want, counter workers use price lists to determine the costs of the parts. They then fill out sales receipts and collect payment from their customers.

When counter workers do not have in

Openings for retail trade sales workers far outnumber openings for other sales workers





Parts counter worker checks a price list to determine the cost of a part.

stock the specific part a customer wants, they may check for interchangeable parts. If no interchangeable part is available, counter workers may place a special order with their supplier or refer the customer to another dealer or parts store.

Sometimes customers are not sure what is wrong with their vehicle or which parts need to be replaced. On these occasions, counter workers may use coil condenser testers, spark plug testers, and other equipment to identify defective parts. In addition to selling, counter workers keep parts catalogs and price lists up to date, replenish stock, and unpack incoming shipments. They also take care of the paperwork involved in selling, such as recording sales, taking inventories, and ordering parts from suppliers. In some firms, particularly small wholesale stores, counter workers also repair parts.

Working Conditions

Automobile parts counter workers usually work in clean and well-lighted stockrooms. The work is not physically strenuous, but counter workers 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. Some strain may result during busy times and when dealing with difficult customers.

Places of Employment

About 97,000 persons worked as automobile parts counter workers in 1978. Automobile dealers and retail automobile parts stores employed most of them. Other employers included wholesalers and distributors of automotive parts. Trucking companies and buslines employ counter workers to maintain their stockrooms and dispense parts to me-

chanics 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. Those who work for warehouse distributors, trucking companies, and buslines are employed mainly 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 familiarize themselves 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 for a counter worker to become capable of handling every aspect of the job.

Generally, employers prefer to hire high school graduates who have some knowledge of automotive mechanics and parts. Mathematical ability is also important. Courses in automotive mechanics, commercial arithmetic, merchandising, selling, and bookkeeping are helpful to persons interested in becoming parts counter workers. 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, persons considering careers as 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.

Employment 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 from employment growth, many openings are expected to be created because of the need to replace experienced workers who retire, die, or transfer to other occupations. The number of openings 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.

Despite the expected growth in employment, future technological developments, such as the use of more durable parts in new vehicles, could slow the growth in demand for replacement parts and thus the need for parts counter workers.

Earnings

Automobile parts counter workers typically work 40 to 48 hours a week and are paid a weekly or monthly salary, or an hourly wage rate. In addition, they may receive commissions on sales. Counter workers employed by automobile dealers in 36 large cities had estimated average earnings of \$6.10 an hour in 1978, slightly higher than the average for all nonsupervisory workers in private industry, except farming.

Many 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 the 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, lost-and-found clerks, mate-

rial 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.

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 car 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 as 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 must be obtained from the State department of motor vehicles. Sales workers fill out the forms necessary for these items, 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.

Successful sales workers always seek to develop customer loyalty and in this manner



After a sale, sales workers may help customers arrange for financing and insurance.

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 and Saturdays. 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 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.

Places of Employment

About 158,000 persons worked as automobile sales workers in 1978. 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.

Even though automobile sales workers are employed throughout the country, most work in heavily populated areas.

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 commercial arithmetic, consumer education, merchandising, selling, 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, with 21 as the minimum age for beginners.

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. Initiative and aggressiveness also are important since the number of cars sold usually depends on the number of prospective customers contacted. Because automobile sales workers occasion-

ally 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.

Employment 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 as workers retire, die, or transfer to other occupations.

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, therefore, will be plentiful in some years but scarce in others.

Earnings

Most sales workers are paid a commission, that is, a percentage either of 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 work-

ers advances against future commissions. A few dealers pay a straight salary. Because it takes some time for beginners to learn to sell cars, dealers often guarantee them a modest salary for the first few weeks or months.

In 1978, sales workers employed by new-car dealers earned about \$335 a week. Earnings varied depending on individual ability and experience, geographic location, and dealership size. For example, sales workers who worked for dealers that sold between 100 and 149 new vehicles annually averaged about \$250 a week, while those employed by dealers that sold 1,000 cars or more averaged about \$390.

Many dealerships, especially the larger ones, also provide bonus and other special incentive programs for selling more cars than expected.

Earnings can change considerably from year to year due to changes in the demand for cars. In lean years, workers with poor sales records may be laid off, or may find better paying jobs in other fields. Many, however, return to selling when the demand for cars improves.

Sales workers receive many fringe benefits. Dealers often furnish their sales staffs with demonstrators 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, manufacturer's sales workers, real estate agents, recreation and sporting goods sales workers, securities 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.

Automobile Service Advisors

(D.O.T. 620.261-018)

Nature of the Work

Service advisors are the link between customers and mechanics in many automobile dealerships and in some large independent garages. When customers bring their cars into the service department, service advisors (sometimes called service writers) find out what needs to be done and arrange for mechanics to do the work.

For routine maintenance, service advisors make out a repair order listing the customer's name and address, make and year of the car, and the work to be done. If a factory warranty covers the repairs, the advisor also records the engine and body numbers, mileage, and date of purchase.

When customers can provide only a sketchy description of the mechanical problem, the service advisor must question the customer and inspect or test drive the car to diagnose the trouble. The advisor then prepares a repair order that describes the symptoms of the problem and its possible cause.

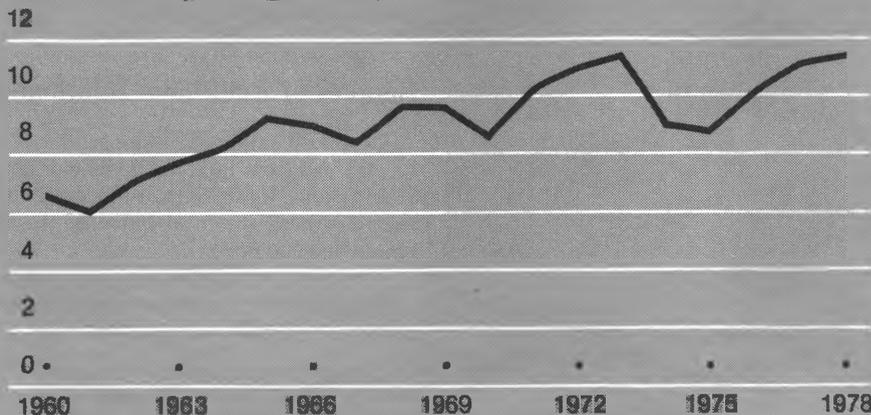
After writing the repair order, service advisors tell the customer what repairs are needed, their approximate cost, and how long the work will take. Since this cannot always be done until mechanics have inspected the cars, service advisors may phone later to give customers this information and to ask permission to do the work. Sometimes customers are reluctant to authorize expensive repairs even if they are necessary, so service advisors may assure them that the work will improve performance and safety and prevent more serious trouble.

In large dealerships and shops, service advisors give repair orders to the shop dispatcher who figures the cost of parts and labor for each order and assigns work to mechanics. In smaller shops, however, advisors perform these duties. Service advisors also answer any questions the mechanics may have about a repair order and often test drive cars after repairs have been made to be sure they are operating properly.

When the customer returns for the car, the service advisor 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

Auto sales fluctuate from year to year, causing job opportunities for automobile sales workers to be abundant in some years and scarce in others

Retail sales of passenger cars (millions)



Source: Motor Vehicle Manufacturers Association

service, the service advisor may adjust the bill, with permission from the service manager.

In addition to advising customers on their service needs, service advisors occasionally assist customers in selecting accessories, such as air-conditioners and radios. Experienced service advisors may also substitute for service managers.

Working Conditions

Most service advisors work 40 to 48 hours a week. They are busiest, and often rushed, in the early morning when most customers bring their cars in for repairs, and in the late afternoon when they return to pick them up. Occasionally, service advisors must deal with irate customers who question or are not satisfied with the repairs made on their cars.

Although service advisors 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.

Places of Employment

About 25,000 persons worked as automobile service advisors in 1978. Most worked for large automobile dealers because dealerships with fewer than 20 employees usually do not employ service advisors. Some worked for large independent automobile repair shops.

Training, Other Qualifications, and Advancement

Service advisors learn on the job under the guidance of experienced service advisors

and the service manager. In many service departments, trainees begin by helping the shop dispatcher. They learn how to route work to the shop mechanics, to compute repair costs, and to estimate the time required for different repairs. Beginners usually can gain enough knowledge and experience in 1 to 2 years to handle most repair jobs. In addition to on-the-job training, some advisors attend formal training programs conducted by automobile manufacturers.

When hiring persons for jobs as service advisor trainees, employers prefer high school graduates who are 21 years of age and who have experience in automobile repair or related activities, such as that obtained in a motor pool in the Armed Forces. Often employers fill these jobs by promoting persons who have worked as mechanic trainees or parts counter worker trainees within their own organization. Some firms prefer to hire mechanics who are experienced in all aspects of automobile repair.

High school and vocational school courses in automobile mechanics, commercial arithmetic, sales, public speaking, and English are helpful.

Because most customers deal solely with the service advisor when having their cars repaired, employers seek persons who can win customer confidence and thus build repeat business. For this reason, applicants should be neat, courteous, even-tempered, attentive listeners, and good conversationalists.

Service advisors with supervisory ability may advance to shop supervisors or to service managers. Some open their own automobile repair shops or gasoline service stations.

Employment Outlook

Employment in this small occupation is expected to increase about as fast as the average for all occupations through the 1980's as the number of automobiles on the road grows. In addition to job openings from employment growth, openings will arise each year due to the need to replace experienced service advisors who retire, die, or leave the occupation for other reasons. The number of openings is expected to be fairly stable from year to year, because the demand for automobile repairs is not very sensitive to changing economic conditions.

Job openings for service advisors will be concentrated in large automobile dealerships and repair shops, most of which are located in heavily populated areas.

Earnings

Service advisors employed by automobile dealers in 36 large cities had average earnings of \$7.75 an hour in 1978, more than one-third higher than the average for all non-supervisory workers in private industry, except farming.

Many service advisors are paid a salary plus a commission, that is, a percentage of the cost of repairs or accessories that their customers paid for. Others are paid a straight commission.

Some service advisors 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

Besides automobile service advisors, workers in other occupations diagnose problems with equipment, materials, or products. Examples of such occupations 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 service advisors, write to:

Automotive Service Industry Association, 444 N. Michigan Ave., Chicago, Ill. 60611.

Automotive Service Councils, Inc., 188 Industrial Dr., Suite 112, Elmhurst Ill. 60126.



Service advisor discusses a repair order with a customer.

Gasoline Service Station Attendants

(D.O.T. 915.467-010 and .477-010)

Nature of the Work

At least once a week, most of the over 145 million motor vehicles on the road are driven into gasoline service stations for fuel and service. Most need only gas and a clean windshield, but service station attendants check for other things as well in order to sell products and to help owners keep their cars in good condition.

Unless a driver is in a hurry, attendants usually check the oil level in the crankcase and the water levels in the battery and radiator. If the customer asks, they also will check the air pressure in the tires and examine fan belts, hoses, and other parts for signs of excessive wear.

Besides offering these basic services, many stations also do repair work and stock replacement parts for often-needed items such as batteries, headlights, and windshield wiper blades. Attendants sell and install these parts and, in some cases, may do minor repair work, such as changing oil, rotating tires, and fixing flat tires. Most of these tasks can be done with screwdrivers, pliers, wrenches, and other simple handtools. Some attendants, called mechanic-attendants, perform more difficult repairs and use more complex equipment including motor analyzers and wheel alignment machines.

When customers pay for their purchases or repair work, attendants collect payments and make change or prepare charge slips.

Attendants also may keep the service

areas, building, and restrooms clean and neat. In some stations, they help the station manager take inventory of automobile parts in stock, set up displays, and keep business records.

If a service station provides emergency road service, attendants may drive a tow truck to the site of the breakdown to "boost" the battery, change a flat tire, or do other minor repairs. When they cannot repair the car on the spot, they tow it back to the station.

Working Conditions

Full-time attendants work 40 hours a week or more. Because many gas stations are open at least 12 hours a day, 6 days a week, work schedules may include evenings, weekends, and holidays.

Attendants work outdoors in all kinds of weather. They do considerable lifting and stooping and spend much time on their feet. Possible injuries include cuts from sharp tools and burns from hot engines.

For many attendants, however, the opportunity to deal with people, to work on cars, and possibly to manage their own service stations someday more than offsets these disadvantages. Also, the opportunity to get part-time employment makes the job attractive to many people.

Places of Employment

About 340,000 people worked as gasoline service station attendants in 1978. About one-third of these were part-time employees. In addition to attendants, about 190,000 gasoline service station managers and owners did similar work.

Service station attendants work in every

section of the country, and in every size community, from rural areas to the largest cities.

Training, Other Qualifications, and Advancement

Applicants for jobs as gasoline service station attendants should have a driver's license, a general understanding of how an automobile works, and some sales ability. They should be friendly, able to speak well, and present a generally neat appearance. They also need self-confidence. Applicants should know simple arithmetic so they can make change quickly and accurately and help keep business records. They also should be familiar with local roads, highways, and points of interest to direct customers and to locate cars whose owners have called for road service.

Many employers prefer high school graduates. A high school education usually is required for those entering service station management training programs conducted by oil companies.

Service station attendants receive most of their training on the job, although there are some formal training programs. Trainees do relatively simple work at first, such as cleaning the station, pumping gas, and cleaning windshields. Gradually, they progress to more advanced work such as performing preventive maintenance, installing accessories on cars, and helping to keep records. It usually takes from several months to a year for a beginner to become familiar with and able to perform all the the jobs around a service station.

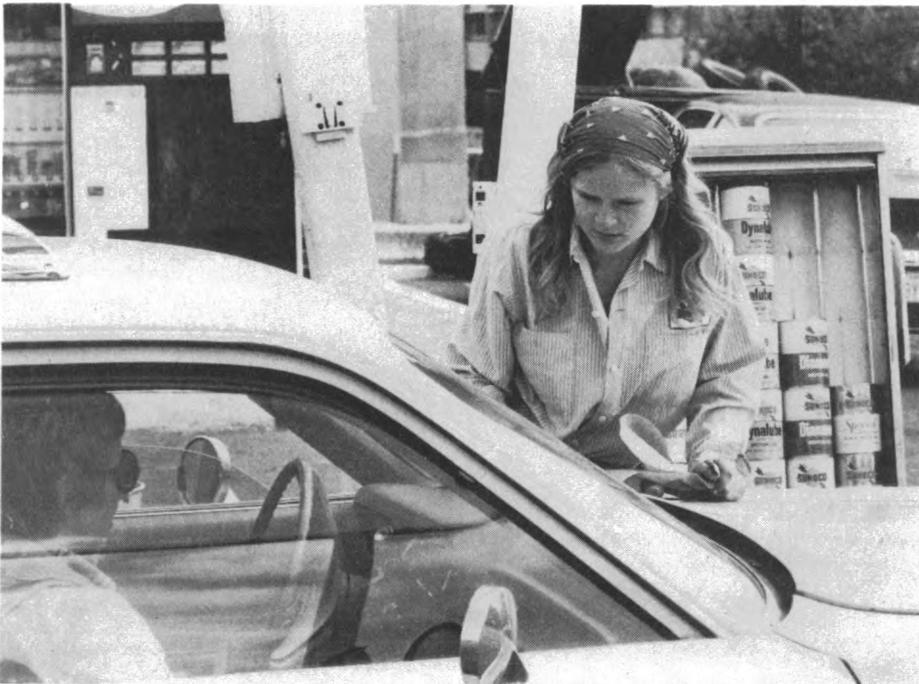
Formal training programs for gasoline service station work are offered in many high schools. In this curriculum, students in their last 2 years of high school take business education courses and work part time in gasoline service stations, where they receive instruction in all phases of service station work.

Most major oil companies conduct 2- to 8-week formal training programs for service station managers. These programs emphasize subjects such as simple automobile maintenance, marketing, and business management.

Several avenues of advancement are open to service station attendants. Additional training qualifies attendants to become automobile mechanics; those having business management capabilities may advance to station manager. Many experienced station managers and automobile mechanics go into business for themselves by leasing a station from an oil company or buying their own station. Oil companies hire some service station managers as sales representatives or district managers.

Employment Outlook

Employment of gasoline service station attendants is expected to decline through the 1980's due to an anticipated slow growth in future gasoline consumption and the trend to self-service stations. Numerous job openings



In addition to pumping gas, attendants perform other tasks such as cleaning windshields and checking oil

are expected each year as workers retire or die. In addition, the high turnover in this relatively large occupation will result in thousands of openings as attendants transfer to other occupations.

Earnings

Earnings of gasoline service station attendants vary considerably. Hourly earnings for many attendants ranged from \$2.50 to \$5.00 in 1978, according to the limited information available. In addition, many attendants are paid a commission based on the value of the products they sell. Attendants employed in large metropolitan areas generally had higher earnings than those in small towns.

Related Occupations

Besides gasoline service station attendants, numerous other workers are involved with the service and maintenance of automobiles, including automobile body repairers, automobile mechanics, automobile painters, automobile service advisors, automobile washers, and industrial garage servicers.

Sources of Additional Information

For more details about work opportunities, contact local gasoline service stations or the local office of the State employment service.

Insurance Agents and Brokers

(D.O.T. 250.257-010)

Nature of the Work

Insurance agents and brokers sell policies that protect individuals and businesses against future losses and financial pressures. They may help plan financial protection to meet the special needs of a customer's family; advise about insurance protection for an automobile, home, business, or other property; or help a policyholder obtain settlement of an insurance claim.

Agents and brokers usually 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 can be designed to provide retirement income, funds for the education of children, or other benefits. Casualty insurance agents sell policies that protect individual policyholders from financial losses as a result of automobile accidents, fire or theft, or other losses. They also sell industrial or commercial lines, such as workers' compensation, product liability, or medical malpractice insurance. Health insurance policies offer protection against the costs of hospital and medical care or loss of income due to illness or injury, and many life

and casualty agents offer health insurance in addition to other lines. Many agents also offer securities, such as mutual fund shares or variable annuities.

An insurance agent may be either an insurance company employee or a broker—an independent business person authorized to represent one insurance company or more. Brokers are not under exclusive contract with any single company; instead, they place policies directly with the company that best meets a client's needs. Otherwise, agents and brokers do much the same kind of work.

They spend most of their time discussing insurance needs with prospective and existing customers. Some time must be spent in office work to prepare reports, maintain records, plan insurance programs that are tailored to prospects' needs, and draw up lists of prospective customers. Specialists in group policies may help an employer's accountants set up a system of payroll deductions for employees covered by the policy.

Working Conditions

Agents must do a considerable amount of traveling to meet with clients. They generally arrange their own hours of work, and often schedule evening and weekends appointments for the convenience of clients. Some agents work more than 40 hours a week.

Places of Employment

About 540,000 agents and brokers sold insurance in 1978, thousands of whom worked part time. About half of the agents and brokers specialized in life insurance; the rest, in some type of property/liability insurance. A growing number of agents (called multi-line agents) offer both life and property-liability policies to their customers.

Agents and brokers are employed in cities and towns throughout the country, but most work near large population centers.

Training, Other Qualifications, and Advancement

Although many employers prefer college graduates for jobs selling insurance, most will hire high school graduates with potential or proven sales ability. Many colleges and universities offer courses in insurance subjects and some schools offer a bachelor's degree in insurance. College courses in subjects such as economics, business law, government, and business administration enable the insurance agent to relate insurance to other personal finance problems and to constantly changing economic conditions. Courses in psychology and sociology 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 will 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 semi-



Agents spend much of their time contacting customers by telephone.

nars 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. There is also a course in health insurance. As agents or brokers gain experience and knowledge, they can qualify for the Chartered Life Underwriter (CLU) designation by passing a series of examinations given by the American College of Bryn Mawr, Pa. In much the same way, a property-liability agent 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 CLU and CPCU designations are recognized marks of achievement in their respective fields.

Agents and brokers should be enthusiastic, self-confident, and able to communicate effectively. Many employers will give personality tests to prospective employees because personality attributes are important in sales work. Since agents usually work without supervision, they need initiative to locate new prospects. For this reason, many employers seek people who have been successful in other jobs.

Insurance agents who show unusual sales ability and leadership may become a sales manager in a local office or assume a managerial job in a home office. A few agents may advance to top positions as agency superintendents or company vice-presidents. Many who have built up a good clientele prefer to remain in sales work. Some, particularly in the property-liability field, eventually establish their own independent agencies or brokerage firms.

Employment 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 die, retire, or leave their jobs to seek other work. 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 quite favorable for ambitious people who enjoy sales work.

Future demand for agents and brokers depends on the volume of insurance sales. Volume should increase rapidly over the next decade as a larger proportion of the population enters the period of peak earnings and family responsibilities. Life insurance sales should grow as more families select policies designed to provide educational funds for their children and retirement income. Rising incomes also may stimulate the sales of equity products such as mutual funds, variable annuities, and other investments. Sales of property-liability insurance should rise as more consumer purchases are insured and as complex types of commercial coverage, such

as product liability and workers' compensation, are expanded.

However, employment of agents and brokers will 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 some of the time-consuming clerical tasks. The trend toward multiline agents also will cause employment to rise more slowly than the volume of insurance sales.

Earnings

Beginners in this occupation often are guaranteed a moderate salary while they are learning the business and building a clientele. In many large companies, new agents receive about \$900 a month during this training period, which can last up to 6 months or longer. 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. After several years, an agent's commissions on new policies and renewals may range from \$12,000 to \$25,000 annually. There is virtually no limit on what an agent can earn, however. Thousands of established agents and brokers earn more than \$40,000 a year, and many highly successful ones earn more than \$100,000 a year.

Agents and brokers generally pay their own automobile and traveling expenses. In addition, those who own and operate independent businesses must pay office rent, clerical salaries, and other operating expenses out of their earnings.

Although insurance agents usually are free to arrange their own hours of work, they often schedule appointments during evenings and weekends for the convenience of clients. Some agents work more than the customary 40 hours a week. Most agents and brokers enjoy excellent fringe benefits such as paid vacations, group insurance plans, and retirement pensions. The size of most pensions is dependent on how much insurance an agent sells. (See the statement on the insurance industry for more information about working conditions in life and property-liability companies.)

Related Occupations

Other workers who have technical sales responsibilities include real estate agents and brokers, securities workers, and manufacturing company representatives.

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.

National Association of Insurance Agents, Inc., 85 John St., New York, N.Y. 10038.

American Alliance of Insurance, 20 N. Wacker Dr., Chicago, Ill. 60606.

The National Association of Independent Insurers, Public Relations Department, 2600 River Rd., Des Plaines, Ill. 60018.

Manufacturers' Sales Workers

(D.O.T. 260 through 279.357)

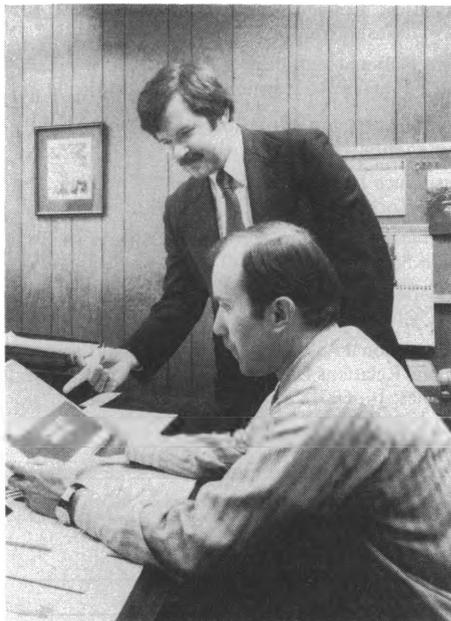
Nature of the Work

Practically all manufacturers—whether they make computers or can openers—employ sales workers. Manufacturers' sales workers sell mainly to other businesses—factories, railroads, banks, wholesalers, and retailers. They also sell to hospitals, schools, libraries, and other institutions.

Most manufacturers' sales workers sell nontechnical products. They must be well informed about their firms' products and also about the special requirements of their customers. When sales workers visit firms in their territory, they use an approach adapted to the particular line of merchandise. A sales worker who handles crackers or cookies, for example, emphasizes the wholesomeness, attractive packaging, and variety of these products. Sometimes sales workers promote their products by displays in hotels and conferences with wholesalers and other customers.

Sales workers who deal in highly technical products, such as electronic equipment, often are called sales engineers or industrial sales workers. In addition to having a thorough knowledge of their firms' products, they must be able to help prospective buyers with technical problems. For example, they may try to determine the proper materials and equipment for a firm's manufacturing process. They then present this information to company officials and try to negotiate a sale, which may take many months. Often, sales engineers work with the research-and-development departments of their own companies to devise ways to adapt products to a customer's specialized needs. Sales workers who handle technical products sometimes train their customers' employees in the operation and maintenance of new equipment, and make frequent return visits to be certain that it is giving the desired service.

Although manufacturers' sales workers spend most of their time visiting prospective customers, they also do paperwork, includ-



Manufacturers' sales workers must be well informed about their firms' products.

ing reports on sales prospects or customers' credit ratings. In addition, they must plan their work schedules, draw up lists of prospects, make appointments, handle some correspondence, and study literature relating to their products.

Working Conditions

Some manufacturers' sales workers have large territories and do considerable traveling. Others usually work in the neighborhood of their "home base." When on business trips, sales workers are reimbursed for expenses such as transportation and hotels. Some companies provide a car or pay a mileage allowance to sales workers who use their own cars.

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. Most sales workers who are not paid a straight commission receive 2 to 4 weeks' paid vacation, depending on their length of service. They usually share in company benefits, including life insurance, pensions, and hospital, surgical, and medical benefits.

Places of Employment

Over 400,000 people were manufacturers' sales workers in 1978. About 16,000 of them were sales engineers. Some work out of their company's home office, often located at a manufacturing plant. The majority, however, work out of branch offices, usually in big cities near prospective customers.

More sales workers are employed by companies that produce food products than by any other industry. Large numbers also work in the printing and publishing, chemical, fabricated metal products, and electrical and

other machinery industries. Most sales engineers work for companies that produce heavy machinery, transportation equipment, fabricated metal products, and professional and scientific instruments.

Training, Other Qualifications, and Advancement

Although a college degree is increasingly desirable, the type and level of education a sales worker needs depend largely on the product and its market.

Manufacturers of nontechnical products often hire college graduates who have a degree in liberal arts or business administration. Some positions, however, require specialized training. Drug sales workers, also known as pharmaceutical detailers, usually need training at a college of pharmacy. Manufacturers of electrical equipment, heavy machinery, and some types of chemicals prefer to hire people who have studied engineering 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*.)

Beginning sales workers may take specialized training before they start on the job. Some companies, especially those that manufacture complex technical products, have formal training programs that last 2 years or longer. In some of these programs, trainees rotate among jobs in several departments of the plant and office to learn all phases of production, installation, and distribution of the product. Other trainees take formal class 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 meet and get along well with many types of people are important. Because sales workers may have to walk or 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 executive jobs in industry are filled by people who started as sales workers.

Because of frequent contact with business people in other firms, sales workers often are able to transfer to other jobs. Some go into business for themselves as independent representatives. Other experienced sales workers find opportunities in advertising and marketing research.

Employment Outlook

Employment in this field is expected to grow about as fast as the average for all occupations through the 1980's because of the rising demand for technical products and the

resulting need for trained sales workers. In addition, 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 will increase as manufacturers emphasize sales activities to compete for the growing number of these valuable accounts.

In addition to the jobs that will be created by growth, many openings will occur each year because of the need to replace workers who die, retire, or leave the occupation. 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.

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

According to the limited information available, salaries for inexperienced sales workers ranged from \$15,400 to over \$22,500 a year in 1978. The highest starting salaries generally were paid by manufacturers of textile mill products, printing and allied products, and apparel and finished products. The average experienced sales worker earned between \$19,200 and \$38,500 in 1978, depending upon the firm and its product. The highest paid sales workers sometimes earned upwards of \$49,500 and \$57,200.

Some manufacturing concerns 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. The majority, however, use a combination of salary and commission, salary and bonus, or salary, commission, and bonus. Commissions vary according to the sales workers' efforts and ability, the commission rate, the location of their sales territory, and the type of product sold. Bonus payments may depend on individual performance, on performance of all sales workers in the group or district, or on the company's sales. Some firms pay annual bonuses; others offer bonuses as incentive payments on a quarterly or monthly basis.

Related Occupations

Sales workers must have a knowledge of sales techniques and a specific knowledge of the products they sell. Some related occupations that employ these same skills are buyers, comparison shoppers, field-contact technicians, and wholesale trade sales workers.

Sources of Additional Information

For more information on the occupation of manufacturers' sales worker, write:

Sales and Marketing Executives International, Career Education Division, 380 Lexington Ave., New York, N.Y. 10017.

Models

(D.O.T. 297.667-014; 961.367-010; and 961.667-010)

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 fashion shows or private showings or model informally—in store restaurants or on the sales floor, for example. In fashion shows, these models display clothing on a platform or runway. While the announcer 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.

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 or in a swimsuit in the middle of winter, 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 evenings out with friends. 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.

Places of Employment

As many as 60,000 persons worked as models in 1978. 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, magazines, 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, and Kansas City.



Models must always look fresh and well rested for the camera.

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 will be remembered.

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 develop 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 under the pressures of competition, tight schedules, and quick 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 gracefully, 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 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 obtain a portfolio of photographs of themselves in various poses and kinds of clothing. The agency then shows the portfolio to prospective clients. Preparing a portfolio is an important part of a model's training. For the beginner, it can provide valuable experience in front of a camera by exposing the model to a number of different photographers.

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.

Employment Outlook

Competition for the available jobs will be keen in the coming years. 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 increasingly offer opportunities in this occupation. Experienced models will continue to receive most of the assignments.

Rising advertising expenditures and sales of clothing and accessories will cause the demand for both photographic and fashion models to increase. Most job openings, however, will result from the need to replace models who have left 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 business executives, most earn far less. According to the limited information available, fashion models working full time for manufacturers or wholesalers generally earned around \$20,000 a year in 1978.

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 \$20,000 to \$50,000 a year; most earned from \$30,000 to \$35,000. Part-time photographic models earned from \$50 to \$100 an hour; models working in retail stores or conventions earned from \$6 to \$10 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 \$170 a day in 1978; principal characters earned around \$250 a day and sometimes received additional income when the commercial was rerun. Models in industrial or educational films earned over \$170 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, exhibit-display representatives, guides, stand-ins or doubles for star performers, character impersonators, and entertainers.

Sources of Additional Information

Employers of models, such as retail stores, advertising agencies, magazines, and newspapers, 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

Housing, whether a home 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. They also act as a medium for price negotiations between buyer and seller, and help to ensure that the final price is fair to both.

Brokers are independent business people who not only sell real estate, but also rent and manage properties, make appraisals, and develop new building projects. In closing sales, brokers usually 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. Brokers also manage their own offices, advertise properties, and handle other business matters. Some combine other types of work, such as selling insurance or practicing 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. In the closing stages of the sale, agents often arrange for a loan, title search, and the final meeting at which the buyer takes possession of the property.

There is more to the agents' job, however, than just selling. They also must have properties to sell. For this reason, agents spend much of their time obtaining "listings" (owner agreements to place properties for sale with the firm). Because obtaining listings

is so important, agents may spend much time 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, churches, shopping facilities, and public transportation, and be familiar with tax rates and insurance coverages.

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 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 40 a week. In addition, they often work evenings and weekends to suit the convenience of their clients.

Places of Employment

About 555,000 persons sold real estate full time in 1978; many others sold on a part-time basis. The number of people licensed to sell totaled almost 2 million in 1978, according to the National Association of Real Estate License Law Officials.

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. Most sales workers, however, work in firms with no more than 5 to 10 other agents. A growing number of brokers, currently about 1 in 5, 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 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 usually can be renewed annually without reexamination.

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.

Young men and women 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. About 360 universities, colleges, and junior colleges offer courses in real estate. At some, a student can earn an associate's 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, and property development and management 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



Almost half of all real estate agents and brokers are women.

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 counseling.

Employment 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.

The favorable outlook for employment 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 families also can be expected to purchase larger homes and vacation properties. During periods of declining economic activity and tight credit, the vol-

ume of sales and the resulting demand for sales workers may decline. During these periods, the number of persons seeking sales positions may outnumber openings. Over the long run, however, the outlook for salespeople is excellent.

Many job opportunities should occur for both college graduates and mature workers transferring from other kinds of work. This field will remain highly competitive and prospects 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 in a real estate firm. The person who obtained the listing often receives

part of the commission when the property is sold; the broker who made the sale either gets the rest of the commission or shares it with the agent who handled the transaction. 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.

Earnings of full-time real estate agents averaged about \$15,000 a year in 1978, according to estimates based on a survey conducted by the National Association of Realtors; agents working fewer than 30 hours a week averaged about \$5,000. Many experienced real estate agents earn \$50,000 a year or more. According to the same survey estimates, real estate brokers earned nearly \$30,000 a year in 1978. Full-time agents earn one and one-half times as much and brokers earn nearly three times as much as average earnings for all non-supervisory workers in private industry, except farming. 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 that are essential for success, including maturity, tact, and a sense of responsibility. Other sales workers who find these 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 real estate commission or board located in each State capital. Many States can furnish manuals helpful to applicants who are preparing for the required written examinations.

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. Even though contact with customers is a part of all sales jobs, the duties, skills, and responsibilities of sales workers are as different as the kinds of merchandise they sell.

In selling items such as furniture, electrical appliances, or clothing, the sales worker's primary job is to create an interest in the merchandise. The sales worker may answer questions about the construction of an article, demonstrate its use, and show various models and colors. In some stores, special knowledge or skills may be needed to sell the merchandise. In a pet shop, for example, the sales worker should know about the care and feeding of animals. People who sell standardized articles such as food, hardware, and cosmetics often do little more than take payments and wrap customers' purchases. (In supermarkets and some drugstores, cashiers 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 or charge slips, 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. (Route drivers, who sell bread, milk, and other products directly to customers on a regular route, are discussed elsewhere in the *Handbook*.)

Working Conditions

Sales workers in retail trade usually work in clean, well-lighted places, and many stores are air-conditioned. Some jobs, however, require work outside the store. A kitchen equipment sales worker may visit prospective customers at their homes, for example, to help them plan renovations, and a used-car sales worker may spend much time at an outdoor lot.

Places of Employment

In 1978, more than 2.8 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 clerk to the giant department store that has 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 those selling general merchandise, apparel and accessories, and food.

Although sales jobs are found in almost every community, most sales workers are employed in large cities and nearby suburban areas.

Training, Other Qualifications, and Advancement

Employers generally prefer high school graduates for sales jobs. Those without a high school diploma can also find jobs, although a work permit may be required for persons

under 18 years of age.

Thousands of high schools across the country have distributive education programs. Generally consisting of a cooperative arrangement between the school and the business community, these programs allow students to work part time at local stores while taking courses in merchandising, accounting, and other aspects of retailing. The experience and education gained can improve the students' 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. Operating out of school districts 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 distributive education and good citizenship. DECA members—students and faculty—run their local 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 different personalities. Among other desirable characteristics are an interest in sales work, a pleasant personality, a neat appearance, and the ability to communicate clearly. Prospective sales workers should also be willing to stand for long periods.

In many small stores, an experienced employee or the proprietor instructs newly hired sales personnel in making out sales slips and operating the cash register. In larger stores, training programs are likely to be more formal and to 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. Selling "big ticket" items—large appliances, furniture, rugs, and the like—usually requires the most knowledge of the product and the greatest talent for persuasion. These departments, therefore, have the most experienced—and the highest paid—sales workers.

Retail selling remains one of the few fields in which able employees may advance to executive jobs regardless of educational background. Although large retail businesses generally hire college graduates as management trainees, this is not the only way to move into jobs at the management level. Some sales workers are promoted to jobs as buyers, department managers, or store managers. Oth-



In selling items such as furniture or clothing, the sales worker's primary job is to create an interest in the merchandise.

ers, particularly in large stores, may advance to administrative work in areas such as personnel or advertising. 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.

Employment Outlook

Employment in retail sales is expected to grow faster than the average for all occupations through the 1980's as rising sales volume and longer store hours increase the need for sales workers. Employment will increase more slowly than the volume of sales, however, as self-service—already the rule in most foodstores—is extended to drug, variety, and other kinds of stores. At the same time, rising income levels may increase the demand for "big ticket" items, such as television sets, that require the sales worker to spend a good deal of time with each customer.

Retail trade will continue to be an excellent 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.

Earnings

In 1979, the starting wage for most retail sales positions not covered by union contracts was the Federal minimum wage, \$2.90 an hour. Exempted were employees of chain firms or independent stores doing less than \$275,000 worth of business per year. In stores where it applies, the minimum wage covers part-time and temporary as well as full-time employees.

Stores in major cities usually are covered by union contracts. Most agreements provide for a progressive pay scale based upon experience and length of employment. In 1979, straight hourly wages ranged from \$3.13 to \$6.62 an hour for beginning full-time sales clerks. Experienced full-time sales clerks averaged \$7.12 after 2 years of experience.

In addition to their salary, some sales workers receive commissions—that is, a percentage of the sales they make. Still others are paid a straight commission alone. Those paid only by commission may find their earnings greatly affected by ups and downs in the economy. Earnings are likely to be highest in jobs that require special skill in dealing with customers or technical knowledge of the merchandise sold. Among the highest paid are people who sell automobiles, major appliances, and furniture. On the average, retail trade sales workers earn about as much as nonsupervisory workers in private industry, except farming.

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 all or part of the cost of such employee benefits as life insurance, health insurance, and a pension.

Many full-time 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, and employees who work overtime receive additional pay or an equal amount of time off during slack periods. Some, especially those employed by stores in suburban shopping centers, regularly work one evening or more a week.

Part-time sales workers generally work during the store's peak hours of business—daytime rush hours, evenings, and weekends.

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, and buyers.

Sources of Additional Information

Information about careers in retail sales is available from:

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

Additional 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:

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

For information about a "70,001" program in your area, write:

"70,001" Limited, Robscott Building, 151 Chestnut Hill Rd., Newark, Del. 19711.

Route Drivers

(D.O.T. 292.353-010 and .483-010)

Nature of the Work

Many industries combine customer relations, sales, and delivery duties into one job—the route driver. Although primarily responsible for delivering their firm's products, route drivers also are the company's repre-

sentatives. Their reaction to customer complaints and requests for special service can make the difference between a larger order or losing a customer. And in many instances, route drivers also are expected to use their selling ability to increase sales to current customers and to gain additional customers within their territories.

Route drivers' duties vary according to the industry in which they are employed, the policies of their particular company, and whether they have a retail or wholesale route—that is whether they deliver to homes or to stores. But, the following examples provide a general picture of the job.

Wholesale bakery route drivers deliver bread, cakes, rolls, and other baked goods to grocery stores. Depending on how many items each store stocks, a driver may visit from 10 to 50 grocery stores each day. At each stop along the route, drivers carry the orders of bread and other baked goods into the store and arrange them on the display racks. Together with the store owner or manager, bakery route drivers check the merchandise delivered and prepare a bill. They also credit the store for the value of the stale items left over from the previous delivery.

Bakery route drivers pay close attention to the items that are selling well or sitting on the shelves so that they can estimate the amount and variety of baked goods that will be sold by each grocery store. They discuss these estimates with the store manager and may recommend changes in the store's order. They also encourage the manager to try new products recently introduced by the bakery. From time to time, route drivers visit new stores opening along their route and try to get their business.

After completing their routes and returning to the bakery, drivers fill out forms indicating the goods they will need the next day. This information is used by the bakery in planning its nightly production.

Many laundries rent linens, towels, work clothes, and other items to businesses. Laundry route drivers service these establishments on a regular basis, replacing soiled items with freshly laundered ones. These route drivers keep a record of what they provide and must make certain that stock rented out eventually is returned. Although they sometimes solicit new business from the smaller establishments in their territory, the larger ones are contacted by regular sales workers in their company.

Vending machine route drivers make certain that the machines in factories, schools, and other buildings on their routes are stocked with merchandise and are in good working order. At each location, they check the items remaining in the machines, replace the stock, and remove the money that has been deposited in the cash boxes. Route drivers keep records of the merchandise they place in each machine and the money they remove. Drivers also examine each vending machine to see that merchandise and change

are dispensed properly and make minor adjustments to machines that are broken. They also may clean machines.

After completing their route, drivers place orders for the merchandise they will need the next day. In order to assure a high sales volume, drivers request items they think customers are likely to buy. Their decisions are based primarily on what products have been selling well, but the weather, time of year, and any discussion they may have had with customers also may be taken into account.

Working Conditions

Route drivers usually load their own trucks, and always unload them, so the job involves considerable lifting, carrying, and walking. In addition, they sometimes are exposed to unfavorable weather conditions when making deliveries. In order to get their products to stores before customers arrive, or to businesses before their employees do, drivers often must begin work early in the morning. But for many route drivers, the fact that they do not work under close supervision is an attractive part of the job. Within certain broad limits, they decide how rapidly they will work and where and when they will have lunch or a rest period.

Places of Employment

About 200,000 route drivers worked for a wide variety of businesses in 1978. Most were employed by laundries, dairies, bakeries, and firms that distribute food and beverages. Because these are located in small towns as well as in large cities, route driver jobs exist in all parts of the country.

Training, Other Qualifications, and Advancement

Route drivers must have a good driving record, and since sales and customer relations are an important part of their work, they also must be able to get along with people. A pleasant voice, an ability to speak well, and a neat appearance are important, as are self-confidence, initiative, and tact.

Route drivers must be able to work without direct supervision, do simple arithmetic, and write legibly. In most States, a route driver is required to have a chauffeur's license, which is a commercial driving permit. Information on this license can be obtained from State motor vehicle departments. Route drivers who handle a great deal of money may have to be bonded. Most employers prefer their route drivers to be high school graduates.

Most companies give new route drivers on-the-job training. This training often consists simply of having new workers accompany experienced drivers on their routes for several days. Some companies, however, also provide instruction on the various types of products sold so that drivers will be better able to handle customer requests as well as be more effective salesworkers. In fact, many laundries insist that new drivers initially



Route drivers must do considerable lifting, carrying, and walking.

spend a few weeks working in various production jobs to get a general knowledge of the laundry process. Some large companies also have classes in sales techniques.

School-and-work programs in retail and wholesale merchandising are helpful to a person interested in entering this occupation. High school courses in sales techniques, public speaking, driver training, bookkeeping, and business arithmetic also are useful. Valuable experience can be gained by working as a sales clerk in a store or by taking some other type of selling job.

Some people enter this occupation as *route driver helpers* (D.O.T. 292.677-010). Helpers are found primarily in the beverage industry. They assist drivers with loading and unloading the truck and may relieve them of some of the driving. When openings occur, helpers may be promoted to drivers.

Route drivers may be promoted to route or sales supervisor, but these jobs are relatively scarce. Some drivers are promoted to better paying sales jobs as a result of their experience in route selling. For many drivers, though, advancement is limited to acquiring better routes. For example, since most route drivers are paid on commission, a route with a larger sales volume will mean higher earnings.

Employment Outlook

The total number of route drivers is expected to change little through the 1980's. Some openings for new workers will arise, however, as experienced route drivers transfer to other fields of work, retire, or die. Applicants with sales experience and good driving records have the best chance of being hired.

Most job opportunities will be in wholesale routes. Since most route driver jobs currently are in wholesale routes, openings due to turnover will be higher on these routes than in retail ones. In addition, employment of retail route drivers is expected to decline, further limiting opportunities.

Earnings

In 1978, route drivers had estimated average annual earnings of \$16,700, according to a survey conducted by the Bureau of the Census. Most route drivers receive a minimum salary plus a percent of the sales they make. Thus, earnings are affected by an individual's selling ability, initiative, and the relationship he or she establishes with customers. Wholesale route drivers usually earn more than those who make deliveries to homes.

The number of hours worked by route drivers varies. Some work only about 30 hours a week; others may work 60 hours or more, depending upon whether they have well-established routes or are trying to build up new ones, and how ambitious they are. The number of hours worked may be limited by a union contract, although many contracts merely specify the earliest hour that work may begin and the latest quitting time.

Many companies require route drivers to wear uniforms. Some employers pay for the uniforms and for keeping them clean.

Many route drivers, particularly those who deliver bakery and dairy products, are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America. Some belong to the unions which represent the plantworkers of their employers.

Related Occupations

Other sales workers who deal with businesses include manufacturers' sales workers and wholesale trade sales workers. Other occupations which involve driving large vehicles through city streets are newspaper delivery drivers, local truckdrivers, and local transit busdrivers.

Sources of Additional Information

For details on route driver employment opportunities, contact local employers, such as bakeries, laundry and linen supply companies, and vending machine companies, or the local office of the State employment service.

Securities Sales Workers

(D.O.T. 251.157-010)

Nature of the Work

When investors want to buy or sell stocks or bonds, they call on securities sales workers to put the "market machinery" into operation.

Both individuals who invest a few hundred dollars and large institutions with millions to invest need such services. These workers often are called *registered representatives, account executives, or customers' brokers*.

When an investor wishes to "buy" or "sell" securities, sales workers 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 purchases it directly from a dealer in the over-the-counter market. After the transaction has been completed, the sales workers notifies the customer of the final price.

In addition, securities sales workers 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, 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 stock and bond 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 handling only certain kinds of securities, such as mutual funds. Some handle the sale of "new issues," such as corporation securities issued for plant expansion funds.

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 social clubs. Telephone solicitation also is not uncommon. 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 transactions. 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 longer, however. Some sales workers accommodate customers by meeting with them in the evenings or on weekends.

Places of Employment

About 110,000 persons were employed as securities sales workers in 1978. 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) or the approximately 6,000 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 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.

Almost all States require persons who sell securities to be licensed. State licensing requirements may include passing an examination and furnishing a personal bond. In addition, sales workers usually 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 and 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. Character investigations also are required.

Most employers provide training to help



Securities sales worker discusses transaction with client.

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. In small firms, and in mutual funds and insurance companies, training programs may be brief and informal. Beginners read assigned materials and watch other sales workers transact business.

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.

Employment Outlook

The number of securities sales workers is expected to grow more slowly than the average for all occupations through the 1980's. Most job openings will result from the need to replace sales workers who die, retire, or transfer to other jobs.

Some increase in employment of securities sales workers is expected as economic growth and rising personal incomes increase the funds available for investment. Growth in the number and size of institutional investors will occur as more people participate in pension plans, purchase insurance, 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.

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. Mature individuals with successful work experience should find many job opportunities.

Earnings

Earnings of full-time, experienced securities sales workers who service individual investors averaged about \$29,000 a year in 1978, according to the limited data available. Those who service institutional accounts earned about \$57,000. Full-time securities sales workers earn about three times as much as the average for nonsupervisory workers in private industry, except farming.

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 agent, real estate agent, and financial service sales agent. Other occupations in the securities business are broker floor representative and securities trader.

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)

Nature of the Work

Making travel arrangements can be frustrating and time consuming. Many travelers, therefore, seek the assistance of travel agents—specialists who have the information and ability to make the best possible travel arrangements, considering the tastes, budgets, and demands of the customer.

Consider the contrast between a corporate executive planning a business trip and a family of four on a restricted budget, both planning a visit to the Virgin Islands. The executive might want to fly first class, stay in a luxurious hotel suite, and have a limousine ready to provide transportation. The agent would make the proper arrangements, and perhaps send the bill to the executive's company. For the family, the travel agent would recommend taking advantage of less expensive low season all inclusive packages and special air fares. The agent would describe the wide range of hotel facilities and prices and would try to arrange the most economical trip possible that would still offer an enjoyable vacation. The agent also would inform the family of the island's climate, arrange for a car rental or escorted sightseeing excursions, and suggest local tourist attractions and restaurants.

For international travel, the agent would provide both the family and the executive

with information on customs on regulations, required papers (passports, visas, and certificates of vaccination), and the most recent currency exchange rates.

When travel agents make arrangements for their clients, they consult fare schedules published by regulatory bodies, such as the Civil Aeronautics Board and the International Air Transport Association. Other guides and fact sheets frequently are used by agents to obtain information on hotel ratings, accommodations, and other tourist information. Moreover, travel agents often use their own travel experiences as a basis for making recommendations.

Travel agents in business for themselves also must 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 frequently travel at substantially reduced rates. Sometimes a hotel or resort will offer a travel agent a free holiday.

Travel agents do not, however, spend most of their time traveling and vacationing. Most of the agent's time is spent behind a desk conferring with customers, completing necessary paperwork, and contacting airlines and hotels for travel arrangements, or promoting group movements. Many agents, especially those who are self-employed, frequently work overtime.

Places of Employment

In 1978, about 18,500 persons in over 6,000 independent agencies worked as travel agents throughout the United States.

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 located 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 by working in an established travel agency before going into business for themselves.

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 become more experienced, 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. An advanced course, leading to the designation of Certified Travel Counselor, is offered by the Institute of Certified Travel Agents to foster professionalism in the travel industry. This course is offered only to experienced travel agents.

Although few college courses relate directly to the travel industry, a college education is sometimes preferred by employers. A student preparing for a career as a travel agent should study geography, foreign languages, and history. Accounting and business management would also be important for those who anticipate starting their own travel agencies. Vocational schools also offer coursework in this area.

Another important qualification for a career as a travel agent is broad experience as a national or international traveler. The ability to speak with some personal knowledge about a city or foreign country often helps to influence customers' travel plans.

As a sales representative, the travel agent must have a pleasant personality and much patience. Agents often must demonstrate their efficiency and responsibility to hard-to-please customers.

Travel agents who start their own agencies must gain formal conference approval before they can receive commissions. Conferences are simply organizations of airlines, shiplines, or rail lines; the International Air Transport Association, for example, is the conference of international airlines. To gain conference approval, the owner of an agency must show that the agency is in operation and financially sound. In addition, the agency generally must employ at least one experienced travel agent who can ar-

range foreign and domestic travel, as well as hotel, resort, and sightseeing accommodations.

Since conference approval can take up to 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 the nominal fees that they may charge for making complicated arrangements. For those considering starting their own agency, the American Society of Travel Agents suggests a minimum of \$20,000 in working capital, or enough to carry the agency through a profitless first year.

Currently, there are no Federal licensing requirements for travel agents. However, because of pending legislation, the licensing of travel agents may become required by several States in the near future.

Employment 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 very sensitive to the fluctuations of the economy, opportunities at any given time depend heavily upon whether or not people can afford to travel. For example, travel spending decreased significantly during the 1973-74 Arab oil embargo, when the price of gasoline increased rapidly.

Despite economic fluctuations, spending on travel is expected to increase significantly through the 1980's. Rapidly increasing travel-related expenditures (mainly for



Personal experience in visiting other countries can help travel agents advise clients about their vacations.

air transportation and lodging) reflect rising incomes and increasing emphasis on leisure-time activities. More people are expected to travel—and do so more frequently—than in the past.

Travel should also increase because earlier retirement and longer vacations give people more free time. The use of charter flights and larger, more efficient planes, especially for trips to other countries, has brought air transportation within the budget of many Americans. 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 upon commissions received from airlines and other carriers, tour operators, and lodging places. Commissions for domestic travel arrangements range from 5 to 10 percent; for cruises, about 10 percent; for hotels, sightseeing tours, and car rentals, 10 percent; and for international travel, about 7 percent. When travel agents arrange individual plans that require several connections and lodging reservations, they generally charge the customer a service fee to cover the time and expense involved in making the arrangements. For many 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 geographic location of the agency determine the salary of an employee in a travel agency. Salaries of travel agents generally ranged from \$9,000 to \$16,000 a year in 1978. Salaried agents usually have standard benefits—pension plans, insurance coverage, paid vacations—that self-employed agents must provide for themselves.

Related Occupations

Travel agents are concerned with organizing and scheduling business or leisure travel or activities. Other workers with similar responsibilities include secretaries, tour guides, airline reservation agents, and rental car agents.

Sources of Additional Information

For further information on a career as a travel agent, contact:

American Society of Travel Agents, 360 Lexington Ave., New York, N.Y. 10017.

Wholesale Trade Sales Workers

(D.O.T. 260 through 279.357)

Nature of the Work

Sales workers in wholesale trade play an important role in moving goods from the factory to the consumer. Each sales worker may represent a wholesaler that distributes hundreds of similar products. A wholesale drug company, for example, may stock its warehouse with many brands of drugs, soap, and cosmetics to supply stores that sell directly to the consumer. Likewise, a wholesale building materials distributor sells hardware and construction materials to builders who would otherwise have to deal with many manufacturers.

At regular intervals, sales workers visit buyers for retail, industrial, and commercial firms, as well as buyers for institutions such as schools and hospitals. They show samples, pictures, or catalogs that list the items which their company stocks. 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 important 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 store personnel improve and update systems for ordering and inventory. In addition, they often advise retailers about advertising, pricing, and arranging window and counter displays. A sales worker who handles specialized products, such as air-conditioning equipment, may give technical assistance on installation and maintenance.

Sales workers do some recordkeeping and attend to other details. They must forward orders to their wholesale houses, prepare reports and expense accounts, plan work schedules, draw up lists of prospects, make appointments, and study literature relating to 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, may carry heavy catalogs and sample cases, and be on their feet for long periods.

Places of Employment

About 840,000 persons were employed as wholesale sales workers in 1978. Wholesale

houses usually are located in cities, but sales workers may be assigned territories in any part of the country. Their territory may cover a small section of a city having many retail stores and industrial users; in less populated regions it may cover half a State or more.

Firms selling machinery and building materials to industrial and business users are leading employers of wholesale sales workers. Other large employers are companies that sell food products. Wholesalers dealing in drugs, dry goods and apparel, motor vehicle equipment, and electrical appliances employ many sales workers as well.

Training, Other Qualifications, and Advancement

The background a sales worker needs depends mainly upon the product line and the market. Selling certain products requires technical training. Drug wholesalers, for example, must know the names and characteristics of the pharmaceutical products they sell. A background in chemistry, biology, or pharmacy would prove useful, if not indispensable. In other product lines, such as food, familiarity with manufacturers and brands becomes much more important than knowledge about the product itself.

Product knowledge is also important when the sales person seeks to stimulate demand. Someone selling electrical machinery to industrial firms, for example, might suggest ways in which new equipment could improve the customer's productivity and cut costs. To discuss the potential applications of a new piece of equipment requires knowledge of that product as well as an understanding of the way the customer's business operates.

Most wholesale sales workers get their jobs in one of two ways—working up the ladder or transferring in with the appropriate background. High school graduates may begin a career with a wholesale firm in a nonselling job or may be hired as a sales trainee. In either case, 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. Later they may learn the prices of articles and discount rates for goods sold in quantities. Next, they are likely to work on "inside" sales, writing telephone orders. Later, as they accompany an experienced sales worker on calls, trainees come to know some of the firm's customers. The time spent in these initial jobs varies among companies, but usually it takes 2 years or longer to prepare trainees for outside selling.

As professionalism grows in wholesale trade and as products become increasingly complex, more and more college graduates enter the sales force directly out of school. Competent 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.



Sales workers must study the literature relating to their products.

Sales trainees in very large wholesale firms participate in formal training programs that combine classroom instruction with short rotations in various nonselling jobs. Most firms, however, have no formal program. Their trainees learn by observing 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.

Sales workers sometimes can augment their on-the-job training with outside programs. While only a few colleges offer courses relevant to wholesale distribution, the number is expected to increase. Trade associations sponsor training programs to fill this need. Vendors, too, hold sessions, usually to instruct sales people how best to sell a particular product line.

Experienced sales workers who have leadership qualities and sales ability may advance to supervisor, sales manager, or other executive positions.

Employment 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 growth, many openings will stem from turnover, which is fairly high in this occupation. Success in selling greatly depends on the ability to locate new customers and persuade them to buy. A number of new sales workers find they are not suited to the competitive nature of selling and leave the occupation.

The number of wholesale sales workers is expected to grow about as fast as the average for all occupations through the 1980's. Businesses and institutions will require a wide variety of products for their own use and for eventual resale. Although many large purchasers and others who require highly specialized products will buy directly from manufacturers, the majority of transactions will involve the wholesale distributor.

As chainstores and other large firms centralize purchasing activities, the value of the sales made to individual customers becomes larger and competition for sales correspondingly greater. Wholesalers can be expected to meet this competition by emphasizing cus-

tom services and increasing the size of their sales forces.

Earnings

According to limited information, most beginning sales workers earned around \$11,000 a year in 1978. Experienced sales workers earned considerably more. Since commissions often make up a large proportion of the sales worker's income, earnings vary widely in this occupation. They also depend on the sales worker's experience and seniority, as well as on the product line. Median earnings of the lowest paid sales workers in 1978 varied from \$14,700 in electrical and electronics goods to \$18,000 in the nondurable goods sector. Median earnings of the highest paid sales workers ranged from \$27,800 in food products to over \$53,000 in paper and paper products.

Compensation plans differ among firms. Many employers pay a salary plus a percentage commission on sales; others pay a straight commission or straight salary. Some include a bonus. Although most wholesale sales workers have steady, year-round work, sales (and commissions) vary because demand for some products—for example, air-conditioning—is greater during certain seasons. To provide sales workers with a steady income, many companies pay experienced personnel a "draw" against annual commissions. Most companies furnish cars or allowances for cars and reimbursements for certain expenses on the road.

Depending on length of service, most sales workers have a 2- to 4-week paid vacation. Many are covered by company benefits, including health and life insurance and retirement pensions.

Related Occupations

In addition to a knowledge of sales techniques, wholesale trade sales workers often are required to have a knowledge of hundreds of similar products. Frequently, sales workers become involved in promoting the use of products. Some occupations that utilize these 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. If no local association is available, write to:

Sales and Marketing Executives International, Career Education Division, 380 Lexington Ave., New York, N.Y. 10017.

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. Altogether, there were 3.3 million construction workers employed in 1978—about 3 out of every 10 skilled workers.

The more than two dozen skilled construction trades vary greatly in size. Several major trades—carpenter, painter, operating engineer, plumber, and electrician—each had more than 200,000 workers; carpenters alone numbered more than 1 million, about one-third of all construction craft workers. In contrast, only a few thousand each were employed in trades such as marble setter, terrazzo worker, and stonemason.

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 structures, including highways, airports, and missile launching pads.

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*: Carpenter, operating engineer (construction machinery operator), bricklayer, iron worker, cement mason, stonemason, and boilermaker. *Finishing workers*: Lather, plasterer, marble setter, terrazzo worker, painter, paperhanger, glazier, roofer, floor covering installer, and insulation worker. *Mechanical workers*: Plumber, pipefitter, construction electrician, sheet-metal worker, elevator constructor, 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.

Because construction workers may need to work with sharp tools, amidst a clutter of materials, while standing on temporary scaffolding, and in bad weather, 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 placing an emphasis on safe

working conditions and are stressing safe work habits—practices that reduce the risk of injuries.

Places of Employment

Nearly 4.8 million persons were employed as construction trade workers throughout all industries. However, most were 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.

Nearly 1 out of 6 construction trade 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.

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.

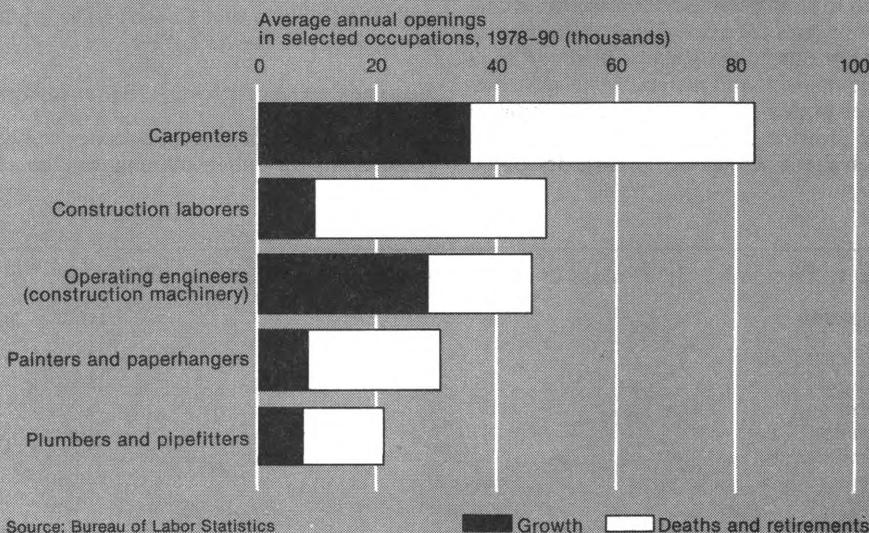
Training, Other Qualifications, and Advancement

Most training authorities recommend formal apprenticeship training as the best way to acquire the all-round skills in 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,

Employment growth and replacement needs will create many job openings in the construction occupations



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. For some trades, manual dexterity, mechanical aptitude, and an eye for proper alignment of materials are important.

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 the construction trades, but usually includes courses such as history of the trade, characteristics of materials, shop mathematics, and basic construction principles.

In most communities, the 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 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 work at their trade. To qualify for these licenses, they must pass an examination to demonstrate a broad knowledge of the job and of State and local regulations.

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 at the trade 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 many other industries. Only a moderate financial investment usually is needed, and it is possible to conduct a fairly substantial business from one's home. However, the contract construction field is very competitive, and the rate of business failure is high among small contractors.

Employment Outlook

Employment in the construction trades is expected to increase faster than 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 transfer to other fields of work, retire, or die. However, since construction is sensitive to changes in the Nation's economy, the number of openings may fluctuate sharply from year to year.

Over the long run, construction activity is expected to grow substantially. The anticipated increases in population and households, and the relatively low level of housing construction in the early 1970's, are expected to create strong pressure for new housing. Among other factors that will stimulate construction activity are higher levels of personal income and a rise in spending for new industrial plants and equipment. Additional money will be spent for building and renovating mass transit systems and for developing and constructing electric 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 out-

side 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 fastest for roofers and operating engineers, and slowest for bricklayers and plasterers.

Earnings

Average hourly wage rates of workers in the construction trades are about twice the hourly wage rate for nonsupervisory and production workers in private industry, except farming. 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 following table shows combined union and nonunion hourly averages for selected construction trades in the largest metropolitan areas surveyed in 1978.

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 the number of hours that they work a year can be adversely affected by poor weather and fluctuations in construction activity.

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 the construction trades are so dependent on one another—particularly on large projects—work delays or strikes in one trade can delay or stop the work of another. The chart on the following page 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 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 ob-

Table 1. Average hourly earnings in selected construction occupations, 1978

| Occupation | Hourly rate |
|------------------------|-------------|
| Electrician | \$11.25 |
| Bricklayer | 10.35 |
| Plumber | 10.10 |
| Carpenter | 10.05 |
| Cement mason | 9.65 |
| Roofer | 9.60 |
| Painter | 9.40 |

SOURCE: Bureau of Labor Statistics.

tained 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, Stonemasons, and Marble Setters

(D.O.T. 861.381-010, -014, -018, -030, and -038.)

Nature of the Work

Bricklayers, stonemasons, and marble setters 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.

Marble setters install marble which provides very decorative and highly durable surfaces. Marble setters, like stonemasons, work mostly on high-cost buildings. The marble they use usually is cut and polished before it is sent to the job site.

In putting up a wall, bricklayers first build the corners at each end of the wall, using plumbines and a level. A line then is stretched from corner to corner as a guide for 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 them with 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 plumbines 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 fill the joints between stones with mortar using a pointed metal tool to smooth the mortar to an attractive finish. To hold stones in place, stonemasons sometimes position pieces of metal within the wall by welding or bolting them together. After positioning the rocks, they cover the metal with mortar. Finally, for a clean appearance, masons wash the stone with a mild acid solution 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, leaving the surface of the stone exposed. To finish, workers trowel the joints and wash the stone.

To cut stone into various shapes and sizes, masons find the grain of each piece of stone and use a special hammer to strike it along a predetermined line. Valuable pieces often are cut with a saw that has a special blade.

Setting marble is very much like setting stone. Marble setters prepare a fine mixture of cement, sand, and water—called mortar—then trowel a thin layer of it onto the surface. For floors and for walls where the holding strength of mortar alone is sufficient, setters—following instructions from blueprints—often handset each marble piece into the mortar, leaving 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, setters use bolts in addition to mortar. Once the marble pieces are positioned and secured, setters mortar and trowel the joints and clean the marble's surface.

In addition to construction work, marble setters 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. When pieces are too large, setters cut them to size using a special saw.

Bricklayers, stonemasons, and marble setters 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

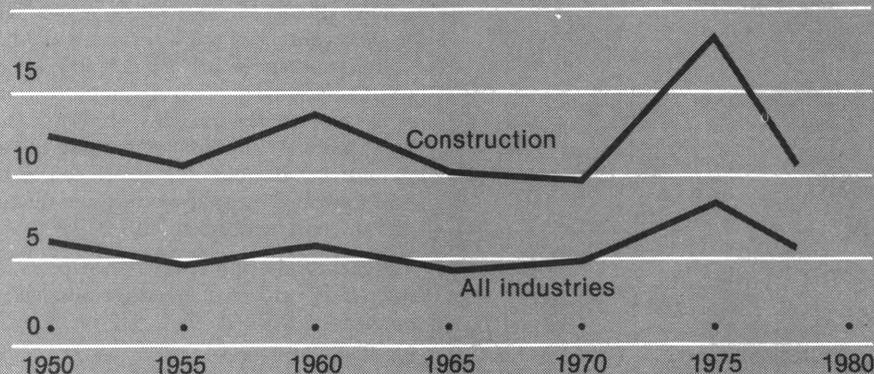
Bricklayers, stonemasons, and marble setters usually work outdoors. They stand, kneel, or stoop for long periods and may have to lift heavy materials to complete a job. They also are subject to injuries from tools and falls from scaffolds. Despite the physical demands and general hazards of construction, however, these workers are less likely to be injured than other construction workers.

Places of Employment

About 204,000 bricklayers, stonemasons, and marble setters were employed in 1978;

Although the unemployment rate in construction has fluctuated, over the last three decades it has been more than twice that in all industries combined

Percent unemployed¹
20



Source: Bureau of Labor Statistics

¹Unemployment rates for wage and salary workers

most 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 are concentrated in metropolitan areas. In cities that are too small to have a demand for full-time stonemasons or marble setters, bricklayers will install stone or marble as a sideline.

About 1 out of 4 bricklayers, stonemasons, and marble setters is self-employed—a proportion higher than that in most building crafts. Many of the self-employed specialize in contracting on small jobs such as patios, walks, and fireplaces.

Training, Other Qualifications, and Advancement

Most bricklayers as well as some stonemasons and marble setters 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 with 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. They begin with simple patterns and progress to more complex designs. Learning to set stone or marble might take several years.

Apprenticeships for bricklayers, stonemasons, and marble setters 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 three 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.

Employment Outlook

Employment of bricklayers is expected to grow more slowly than the average for all occupations through the 1980's. Although few job openings will result from growth in the demand for these workers, many openings will arise as experienced bricklayers retire, die, or leave the occupation for other reasons. Almost all new employees will be hired as bricklayers.

While 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. However, the substitution of cement or other less expensive materials for brick will moderate employment growth.

The number of job openings for bricklayers may fluctuate from year to year because employment in this trade is sensitive to ups and downs in construction activity. For any given year, however, opportunities are best during the spring and summer when construction activity picks up.

Employment of stonemasons and marble setters is not expected to change significantly through the 1980's. Stone and marble have lost 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 due to the need to replace stonemasons and marble setters who retire, die, or leave these occupations.

Earnings

According to a 1978 survey in metropolitan areas, average hourly union wage rates were about \$11.05 for bricklayers, \$11.25 for stonemasons, and \$10.75 for marble setters. A separate survey of the largest metropolitan areas indicate that union and nonunion bricklayers, combined, had average hourly earnings of \$10.35. This rate is about twice the average wage of nonsupervisory and production workers in private industry, except farming. However, yearly earnings for workers in these trades 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.

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 proportion of bricklayers, stonemasons, and marble setters are members of the Bricklayers, Masons and Plasterers' International Union of America.



Bricklayers leveling and aligning freshly laid cement block.

Related Occupations

Bricklayers, stonemasons, and marble setters 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, iron workers, terrazzo workers, tilesetters and various types of welders.

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 through .684)

Nature of the Work

Wood is one of the most important building materials. It is used in homes, factories, bridges, tunnels, and other structures. Carpentry—using wood for construction and repair—has been an important craft for centuries. Today carpenters work with other building materials such as plastic and fiberglass as well as wood. Their skills are so important and versatile that carpenters make up the largest group of building trade workers.

In the construction industry, carpentry commonly is divided into two categories—"rough" and "finish." Examples of "rough" carpentry include building house frameworks, scaffolds, and wooden forms for concrete, as well as erecting docks, bridges, and supports for tunnels and sewers. "Finish" carpentry includes building stairs, installing doors, cabinets, wood paneling and molding, and putting up acoustical tiles. In finish carpentry, appearance is just as important as structural integrity. Skilled carpenters do both rough and finish work.

The duties of carpenters vary even within the broad categories of rough and finish carpentry. The type of construction, size of the company, skill of the carpenter, community

size, and other factors affect the carpenter's work. A carpenter who is employed by a large contractor, for example, may specialize in laying hardwood floors, while one who is employed by a small contractor may build wall frames, put in insulation, install paneling, and even paint. The duties of carpenters also vary because each carpentry job is unique in many ways. Carpenters often have great freedom in planning and performing their work. However, carpentry techniques are standard, and most jobs involve the following steps to some extent.

Working from blueprints, instructions from supervisors, or both, carpenters first do the layout—measure the area and the materials. Local building codes may dictate what materials have to be used for certain jobs and carpenters may have to know these requirements. Wood or other material is cut or shaped with hand and power tools, such as 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.

Carpenters not employed in the construction industry usually do 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. All carpenters use handtools such as hammers,

saws, chisels, planes, and power tools such as powersaws, drills, and rivet guns.

Working Conditions

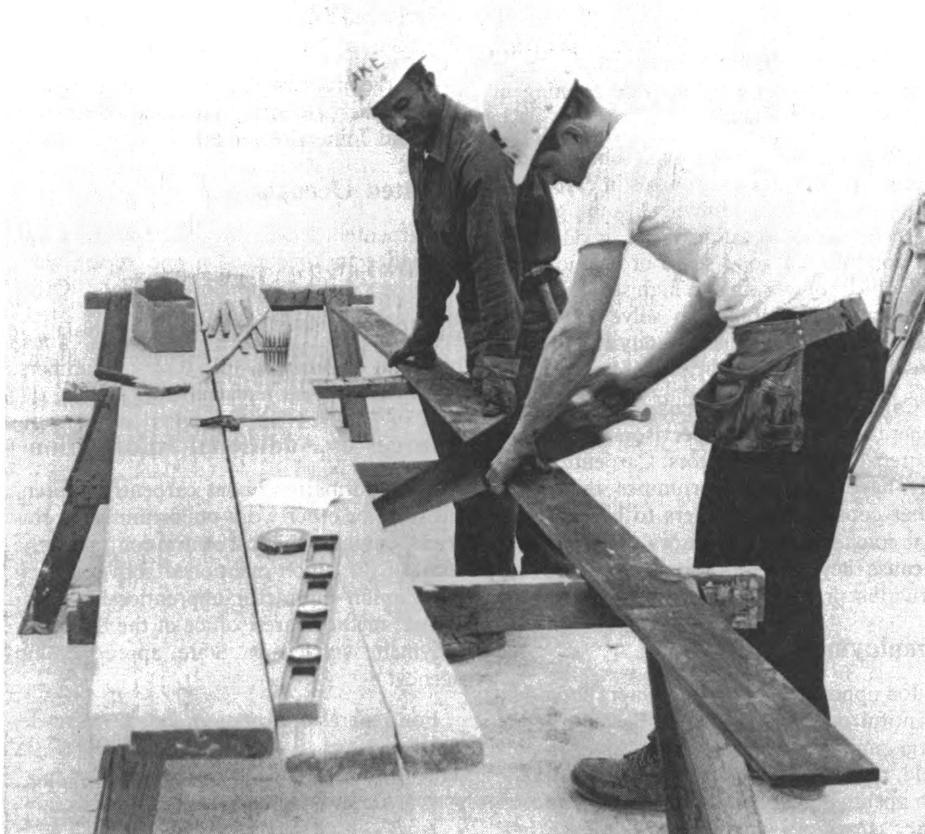
As in other building trades, the carpenter's work is active and sometimes strenuous. Prolonged standing, climbing, and squatting often are necessary. Carpenters risk injury from slips or falls, from contact with sharp or rough materials, and from the use of sharp tools and power equipment. Many carpenters work outdoors.

Some carpenters change employers each time they finish a construction job. Others alternate between wage employment for contractors and self-employment on small jobs.

Places of Employment

In 1978, about 1,253,000 carpenters were employed of whom nearly one out of four were self-employed. Most carpenters work for contractors and homebuilders who construct, remodel, or repair buildings and other structures. Some do construction and maintenance for government agencies, utility companies, manufacturing firms, or other large organizations.

Carpenters work throughout the country and, because of their versatility, are much less concentrated geographically than any other construction occupation.



Carpenters cut, shape, and join wood for a variety of building jobs.

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, have acquired their skills informally (for example, by working as carpenters' helpers).

The apprenticeship programs, administered by local contractors' associations or by joint committees of contractors and unions, consist of 4 years of on-the-job training and a minimum of 144 hours of related classroom instruction each year. 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 provided by employers usually is less thorough than apprenticeships. The degree of training and supervision in these programs often depends on the size of the employing firm. A small contractor who specializes in homebuilding may provide training in only one area—for example, rough framing. In contrast, a large general contractor may provide training in several carpentry skills.

A high school or vocational school education is desirable, as are courses in carpentry, shop, mechanical drawing, and general mathematics. Manual dexterity, good physical condition, a good sense of balance, and lack of fear of working on high structures 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. Some carpenters become contractors. Carpenters usually have greater opportunities than most other construction workers to become general construction supervisors or contractors because they learn more about the entire construction process in their work.

Employment Outlook

Job opportunities for carpenters should be plentiful over the long run. Because of the large number of people employed in this field, replacement needs are high. Besides the job openings that result from the need to replace carpenters who retire, die, or leave their job for other reasons, openings will be created by employment growth.

Most of the growth in carpenter employment will occur during the early 1980's. Most carpenters work in the construction industry; demand for carpenters varies with the level of construction activity. Through the mid-1980's, growth in the number of households and business expansion will stimulate construction activity, especially for new houses. As the number of households grows more slowly through the late 1980's the level of construction activity and the growth of carpenter employment will slowdown.

Because construction activity is sensitive to ups and downs in the economy, the number of job openings may fluctuate greatly from year to year. Carpenters with all-round training will be in much greater demand and will have better opportunities for advancement than those who can do only relatively simple, routine types of carpentry.

Earnings

According to a survey of metropolitan areas, wage rates for construction carpenters averaged \$10.05 an hour in 1978. In comparison, the average rate for production and non-supervisory workers in private industry, except farming was \$5.69. Annual earnings, however, may not be as high as the hourly rates would indicate, because carpenters lose some worktime due to poor weather and occasional unemployment between jobs. Hourly earnings of maintenance carpenters range from about \$5 to \$9, according to a survey of selected metropolitan areas.

Hourly wage rates for apprentices usually start at about 50 percent of the rate paid to experienced carpenters and increase by about 5 percent at 6-month intervals.

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, house builders, 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, .461.010, 684.010, and 861.381-046)

Nature of the Work

Cement masons mix, place, and finish concrete for many types of construction projects. The projects range from finishing of small jobs, such as patios and floors, to work on huge dams and miles of concrete highways. On small projects, a mason, assisted by one or two helpers, may do all of the masonry work; on large projects, a crew of several masons and many helpers 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 the same as that for cement masons.

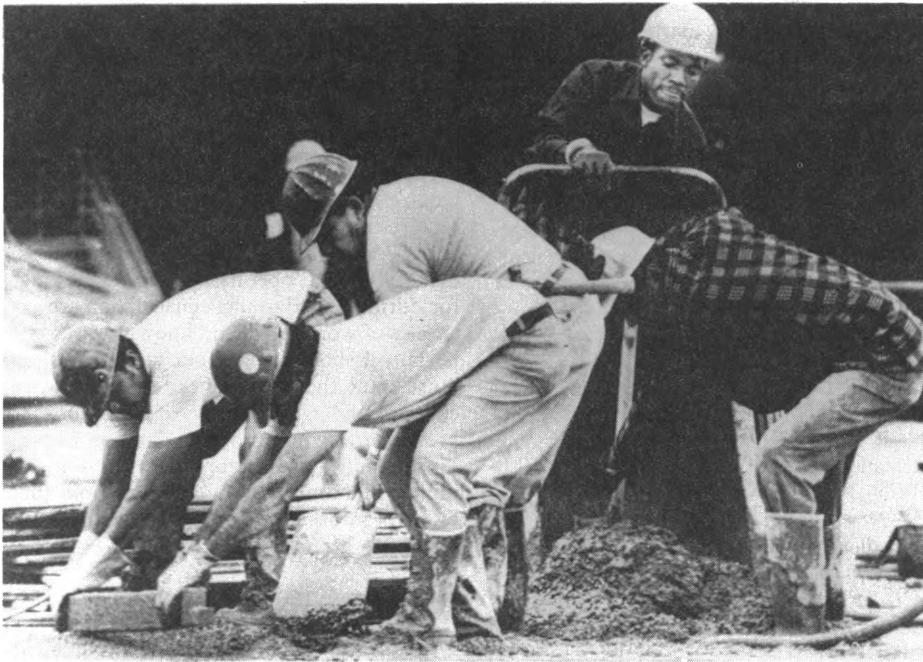
In preparing a site for placing concrete, cement masons make sure the forms for molding the concrete are set for the desired pitch and depth and are properly aligned. Masons direct the pouring of the concrete and supervise laborers who use shovels or special rakes to place and spread the concrete. Masons then guide a "straightedge" (a long, straight piece of wood or similarly shaped piece of 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 cement, masons carefully press a "darby" (a long, straight 1-inch 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 heavy 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 them from chipping or cracking.

For joints, finishers use a flat tool that has



Teamwork is essential when working with freshly poured concrete.

a smooth ridge protruding from the center. At specified spacings, workers make joints or grooves that help prevent unsightly cracks 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—mortar—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 some jobs, electrically powered trowels may be 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. They wash any excess cement from the exposed chips with a mild acid solution for a neat appearance. For color, they sprinkle on a dye which they brush and trowel 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. Because of the effects of heat, cold, and wind on the drying time of cement, masons must be able to recognize by sight and touch what is occurring in the concrete so that they can prevent structural defects.

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 inches to 4 inches deep.

After the forms are removed from the foundation, workers apply a 1-inch deep mixture 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 strips are level with one another. These ferrule strips become a network of rigid dividers for terrazzo panels, allowing for unique 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. When the surface is dry, terrazzo workers clean, polish, and seal it for a rich, lustrous finish.

Working Conditions

Mason or terrazzo work is active and strenuous. Since most finishing is done on floors at ground level, workers must stoop, bend, and kneel. Some jobs are outdoors; however, work generally is halted during rain or freezing weather.

Places of Employment

About 83,000 cement masons and terrazzo workers were employed in 1978. Cement masons work for general contractors who construct entire projects, such as highways or large buildings, and for contractors who do only concrete work. Some masons install composition 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.

One out of eight cement masons and terrazzo workers is self-employed, about the same proportion as 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-year or 3-year apprenticeship programs. About one-third of all cement masons worked as construction laborers before becoming cement masons.

On-the-job training programs, almost all of which are available to cement mason trainees, provide informal instruction from experienced workers. Helpers learn to handle 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 usually within a year helpers are doing finishing work.

Two-year and three-year apprenticeship programs, usually sponsored by local union-contractor agreements, also provide on-the-job training in addition to 144 hours of classroom instruction each year. In the classroom, apprentices learn applied mathematics, and safety. Three-year apprentices receive special instruction in layout work and estimating.

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.

Experienced cement masons or terrazzo workers may advance to supervisors or contract estimators, or may open concrete contracting businesses.

Employment 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, highways, offices, factories, and other structures. The greater use of concrete as a building material also will add to the demand for these workers. Prestressed concrete columns, for example, are being used increasingly in place of steel columns for large buildings. Besides the job openings created by growth in the need for these workers, many openings will arise as experienced masons retire, die, or transfer to other fields of work. For terrazzo workers, most, if not all, openings will arise from replacement needs.

While the employment outlook is expected to be favorable over the long run, the number of job openings may fluctuate from year to year because construction activity is sensitive to ups and downs in the economy.

Earnings

Cement masons and terrazzo workers in the largest metropolitan areas had estimated average wages of \$9.65 an hour in 1978, about twice the average wage for nonsupervisory and production workers in private industry, except farming. 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.

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 are union members. They 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 tools and knowledge of building materials to construct buildings, highways, and other structures. Other occu-

pations involving similar skills include bricklayers, form builders, marble setters, 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., Suite 711-718, Washington, D.C. 20005.

International Union of Bricklayers and Allied Craftsmen, 815 15th St. NW., Washington, D.C. 20005.

National Ready-Mixed Concrete Association, 900 Spring St., Silver Spring, Md. 20910.

Portland Cement Association, Old Orchard Rd., Skokie, Ill. 60076.

Operative Plasterers' and Cement Masons' International Association of the United States and Canada, 1125 17th St. NW., Washington, D.C. 20036.

National Terrazzo and Mosaic Association, 2-A W. Loudoun St., Leesburg, Va. 22075.

Construction Laborers

(D.O.T. 862.684-014 and -026, 869.664-014 and -687-026)

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 mechaniza-

tion 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.

Places of Employment

About 860,000 workers were employed as construction laborers in 1978. 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. Most new employees transfer from other occupations, such as truckdriver, farm laborer, or janitor.

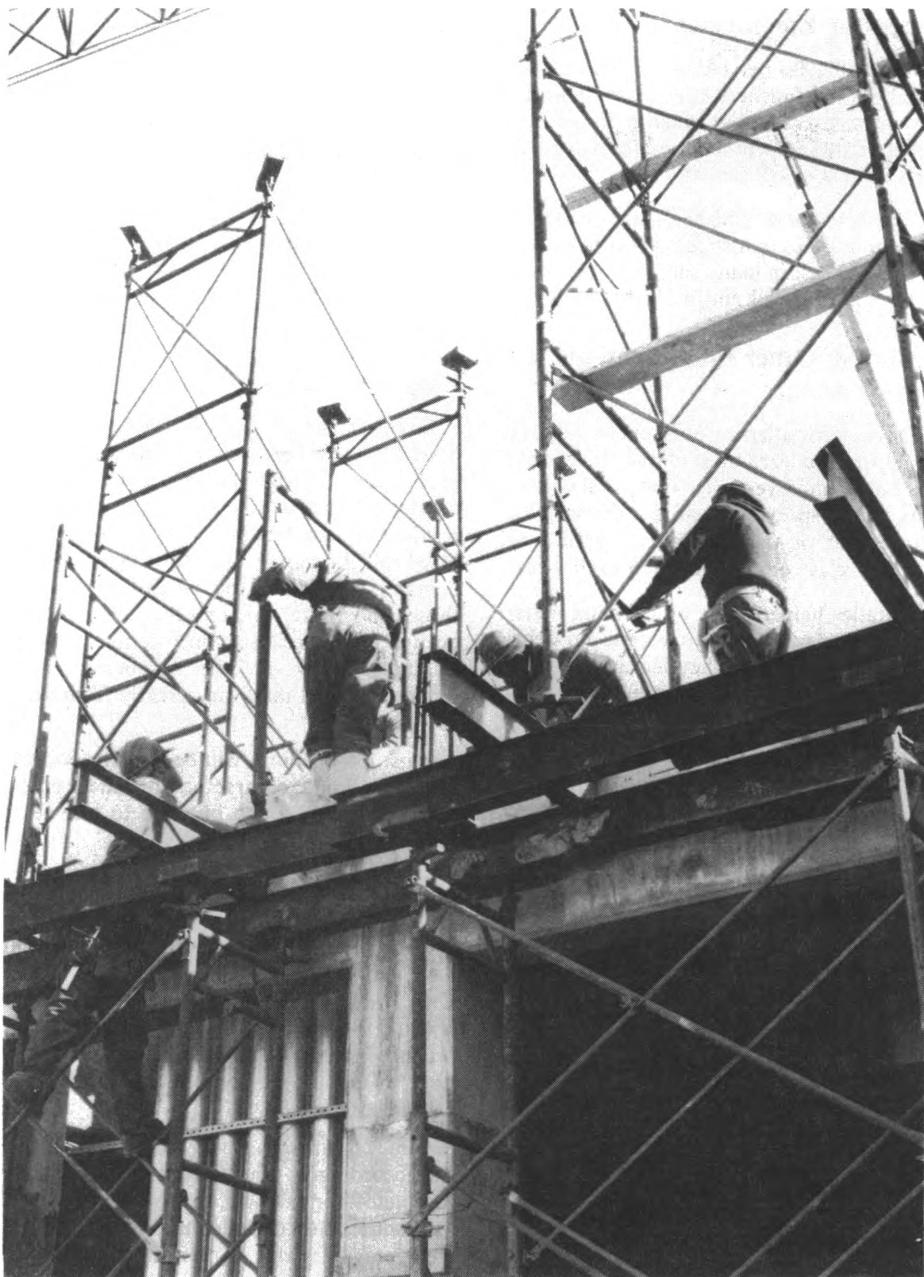
Beginners' jobs are usually of the simplest type, such as unloading trucks and digging ditches. As workers gain experience, job assignments become more complex.

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.

After several years of experience and training, many laborers advance to craft jobs, such as carpenter, bricklayer, or cement mason.

Employment Outlook

Employment of construction laborers is expected to grow about as fast as the average for all occupations through the 1980's. Some growth will occur in the demand for these



Laborers erect scaffolding at the job site.

workers, but most job openings will result from the need to replace workers who retire, die, or leave the occupation for other reasons. On the average, tens of thousands of job openings will become available each year. Because employment of laborers is sensitive to the ups and downs in construction activity, however, the annual number of openings may fluctuate.

Over the long run, 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 dams, highways, high-rise buildings, and bridges.

Earnings

Union wage rates for construction laborers averaged \$8.45 an hour in 1979, compared

with \$5.70 an hour for production and non-supervisory workers in private industry, except farming.

Annual earnings for construction laborers 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.

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 office 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.

Drywall Installers and Finishers

(D.O.T. 842.381-010 and .681-010)

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 in response to 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.

Drywall panels are manufactured in standard sizes—for example, 4 feet by 12 feet. Thus, 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. An installer usually is assisted by a helper because large panels are too heavy and cumbersome for one person to handle.

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 metal rods and channels to size, bolt them together to make floor-to-ceiling frames, and attach the drywall panels to the frames with screws. The workers also erect suspended ceilings. They hang metal bands from wires that are embedded in the concrete ceiling. Installers crisscross bands

horizontally across the room to form rectangular spaces for ceiling panels.

After the drywall has been installed, finishers fill joints between panels with a quick-drying paste. Using the wide, flat tip of a special knife, and brushlike strokes, they spread the paste into and along each side of the joint. Before the paste dries, workers use their knives to press a perforated paper tape into the paste and to scrape away excess paste. When the first application of paste is dry, finishers apply another to fill any depressions and to make a smooth surface. Nail and screw heads also are covered with this compound. Finishers sand these patched areas to make them as smooth as the rest of the wall surface. They 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.

Places of Employment

About 82,000 persons worked as drywall installers and finishers in 1978. Most worked for contractors that specialize in drywall construction; others worked for contractors that 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

Drywall installers or finishers usually start as helpers and learn most of their skills on the job. Some employers, in cooperation with unions, offer special 2-year programs which supplement on-the-job training with a few hours of classroom instruction each week.

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.

Finish 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, they learn to estimate costs of installing and finishing drywall.

Employers prefer high school graduates who are in good physical condition, but applicants with less education frequently are hired. 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.

Employment Outlook

Employment of drywall workers is expected to grow faster than the average for all occupations through the 1980's due to an increase in construction activity, particularly residential construction. Besides workers hired to fill openings arising from increased demand, many will be needed to replace those who retire, die, or take jobs in other occupations. Because construction activity fluctuates, however, the number of new workers needed may vary greatly from year to year.

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 in 1978 averaged about \$10 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 3 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. Unlike many construction workers, installers and finishers work indoors and do not lose time and pay when the weather is bad.

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 to work precisely and accurately to make materials fit according to a set plan. Other occupations that require similar abilities include woodboat builders, cabinet makers, carpenters, form builders, and house builders.



Specialty designed stilts give this finisher the added height needed to reach the ceiling.

Sources of Additional Information

For details about job qualifications and training programs, write to:

Association of Wall and Ceiling Industries—International, 1711 Connecticut Ave. NW., Washington, D.C. 20009.

National Joint Painting, Decorating, and Drywall Apprenticeship and Training Committee, 1709 New York Ave. NW., Washington, D.C. 20006.

Electricians (Construction)

(D.O.T. 824.261-010 and .681-010)

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 onto 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.

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.

Places of Employment

Most of the 270,000 construction electricians employed in 1978 worked for electrical contractors. Many others were self-employed contractors. Construction electricians are employed throughout the country, but 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.

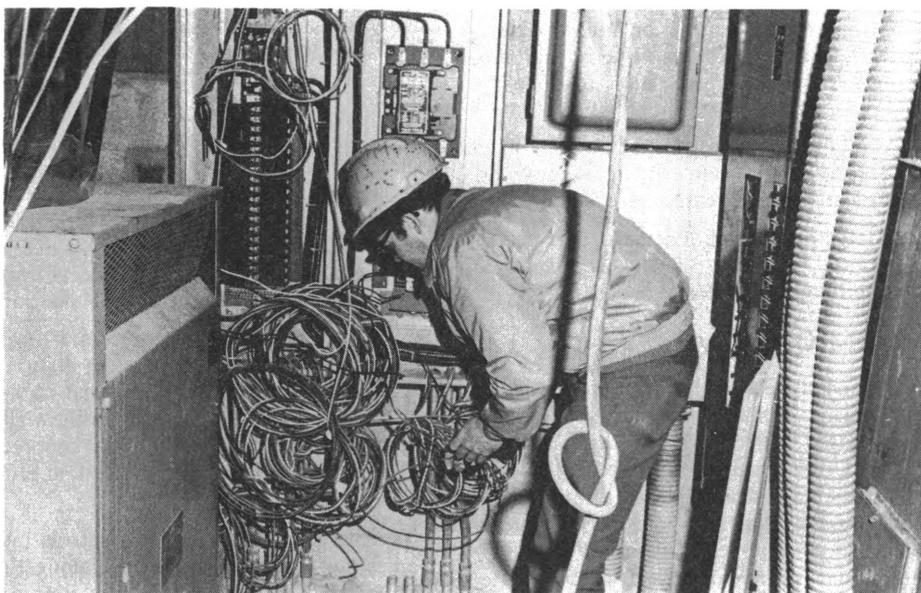
Apprenticeship programs are sponsored through and supervised by local union-management committees or company management committees. While the programs are separate, the content, amount of training,

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 firstaid 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. In time and with experience, 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 good safety practices.

All applicants should be in good health and have at least average physical strength. Good color vision is important because workers frequently must identify electrical wires by color. Also important are agility and dexterity. 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 cities, an electrician must pass an examination which requires a thorough



Wires must be positioned and connected with care.

knowledge of the craft and of State and local building codes.

Experienced construction electricians can advance to supervisors, superintendents, or contract estimators for contractors on construction jobs. Many electricians start their own contracting businesses. In most large urban areas, a contractor must have an electrical contractor's license.

Employment 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 retire, die, or leave the occupation for other reasons. Opportunities will be best for persons with apprenticeship training.

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. When construction jobs are not available, however, electricians may transfer to other types of electrical work. For example, they may find jobs as maintenance electricians in factories or as electricians in shipbuilding or aircraft manufacturing.

Earnings

According to a survey of only some of the largest metropolitan areas, wage rates for electricians averaged \$11.25 an hour in 1978. Union hourly wage rates averaged higher. Wage rates were about twice the averaged wage of nonsupervisory workers in private industry, except farming. 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 Occupation

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, field engineers, and maintenance electricians.

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 Associated Independent Electrical Contractors of America; 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:

Associated Independent Electrical Contractors of America, 1201 N. Watson Rd., Suite 201, Arlington, Texas 70611.

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

National Association of Lighting Maintenance Contractors, 1750 Old Meadow Rd., Suite 3-A, McLean, Va. 22102.

National Electrical Contractors Association, 7315 Wisconsin Ave. NW., Washington, D.C. 20014.

National Joint Apprenticeship and Training Committee for the Electrical Industry, 9700 E. George Palmer Hwy., Lanham, Md. 20802.

Elevator Constructors

(D.O.T. 825.281-030 and .361-010)

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. Installation or repair work usually is performed by small crews consisting of skilled elevator constructors and their helpers.

When installing a new elevator, mechanics first prepare the elevator shaft—a vertical opening that passes through the floors of a building and allows the elevator to move up and down. They remove any obstructions such as wood or metal crossmembers and, at the bottom of the shaft, they may erect forms, then mix and pour concrete for a foundation.

So the elevator will move up and down safely and smoothly, workers erect a strong steel frame within the shaft. For the frame, they bolt heavy steel guide rails to the walls along the shaft as well as to the steel supports fastened to the walls around the shaft at each floor.

To install electrical wires and controls, mechanics run special metal tubing along the shaft's walls from floor to floor. Workers then pull plastic-covered electrical wires through the tubing, which helps protect the wires. Next, they install circuit breakers and switches—usually at each floor and at the main control panel. Finally, workers fasten

the wires to the switches and test for proper connections.

Next, mechanics assemble the elevator car at the bottom of each shaft. "Footings" of the car frame are set into the grooves of the heavy steel guide rails; the frame parts are bolted or welded together. Workers then install the car's platform, walls, ceiling, and doors.

For each elevator, workers install a hoist. 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.

With the car assembled and the hoist installed, workers connect the necessary electrical wires which will carry signal instructions for the car's operation.

Next, at the elevator entrances on each floor, mechanics bolt metal door frames to the concrete, metal, or wood ceilings, floors, and walls. The frames support the grooved metal tracks along which the doors open and close. After setting the doors in the frames, workers connect and test the wires that help to operate the doors.

Finally, after the connections have been tested, the cables secured, and the guide rails greased, the entire system is checked for proper operation.

Elevator constructors employ similar work techniques 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, while elevators need sophisticated circuits and many wires, escalators only need one electric wire. Workers simply connect the wire from a switch to the motor that drives the giant bicycle-like chain and rotates the stairs.

In addition to elevators and escalators, constructors install other devices such as dumbwaiters, material lifts, and powered walkways.

Alteration work is similar to new installation because all elevator equipment except the old rail, car frame, platform, and counterweight is generally replaced. Mechanics inspect elevator and escalator installations periodically and, when necessary, adjust cables and lubricate or replace parts.

Alteration work on elevators is important because of the rapid rate of innovation and improvement in engineering.

To install and repair modern elevators, most of which are electrically controlled, elevator constructors must have a working knowledge of electricity, electronics, and hy-



Elevator constructor retightening winch bolts loosened by vibration.

draulics. They also must be able to repair electric motors as well as control and signal systems. Because of the variety of their work, they use many different handtools, power tools, and testing meters and gauges.

Working Conditions

Elevator construction involves lifting and carrying heavy equipment and parts, but this is usually done by helpers. Most of the work takes place indoors and at great heights. Workers are exposed to the dangers of falls and electrical shocks.

Places of Employment

Most of the estimated 17,000 elevator constructors in 1978 were employed by elevator manufacturers to do installation, modernization, and repair work. Some are employed instead by small, local contractors who specialize in elevator maintenance and repair. Still others work 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 skills through on-the-job training supplemented by classroom instruction. On the job, trainees are assigned initially to experienced elevator mechanics. Beginning

tasks include carrying materials and tools, bolting rails to walls, and assembling cab parts. 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 electrical theory. Later on, trainees learn to test and adjust elevators for maximum performance. In the classroom, trainees learn electrical and electronic theory, mathematics, applications of physics, and safety techniques.

Generally, training 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.

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.

Employment 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 will create job openings in elevator and escalator construction, as will the need to replace experienced workers who retire, die, or stop working for other reasons. The total number of job openings will be limited, however, because of the relatively small size of the occupation.

Earnings

In 1978, union elevator constructors in metropolitan areas had estimated average wages of \$11.90 an hour, or twice the average wage paid to production and nonsupervisory workers in private industry, except farming. Hourly wage rates for trainees start at about 50 percent of the rate paid to experienced elevator mechanics, reach 70 percent at the end of the 6-month probation period, and thereafter increase periodically.

Unlike most other construction trades, elevator constructors usually work year round. When construction of new buildings declines, the construction of new elevators and escalators declines, but the demand for the repair and maintenance of older elevators and escalators increases. Because the balance between new construction and repair work produces steady employment, mechanics work more hours annually and achieve higher annual earnings than most other construction trades.

Most elevator constructors are members of the International Union of Elevator Constructors.

Related Occupations

Elevator constructors couple their knowledge of electricity, electronics, and general construction with their skill in measuring and building to construct permanently placed, sophisticated devices that help to move people and materials. Other workers that share some of these characteristics include electricians, electrical repairers, line installers or repairers, maintenance mechanics, radio mechanics, and structural steel workers.

Sources of Additional Information

For further details about work opportunities as a helper in this trade, contact elevator manufacturers, elevator construction or maintenance firms, or a local office of the union mentioned. In addition, the local office of the State employment service may have information about opportunities in this trade.

For general information about the work of elevator constructors, contact:

International Union of Elevator Constructors, 5565 Sterrett Place, Clark Bldg., Suite 332, Columbia, Md. 21044.

tractor-sponsored programs provide comprehensive training that covers both carpet and resilient flooring work.

Applicants for helper or apprentice jobs should be at least 16 years old and 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. 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.

Employment Outlook

Employment of floor covering installers is expected to increase faster than 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 retire, die, or leave the occupation for other reasons. 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. Fewer opportunities will arise in this relatively small field for workers who can install only resilient flooring.

Earnings

Information from a limited number of firms indicates that experienced floor covering installers earned between \$7 and \$9 per hour in 1978. 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.

Installers generally work regular daytime hours. Particular circumstances, however, such as installing a floor in a store or office, may require work during evenings or weekends.

Many floor covering installers belong to unions, including the United Brotherhood of Carpenters and Joiners of America, and 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, exterminators, 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.

Resilient Floor Covering Institute, 1030 15th St. NW., Suite 350, Washington, D.C. 20005.

Glaziers

(D.O.T. 865.381-010)

Nature of the Work

Glass serves many uses in modern buildings; insulating glass keeps in warmed or cooled air; wire glass makes doors and windows more secure; and large glass panels give huge skyscrapers a distinctive look. Construction glaziers install all types and sizes of building glass. For some jobs, the glass is precut and ready to install. For other jobs, glass must be cut before being installed.

To prepare the glass for cutting, glaziers measure and mark the glass to fit the opening, then rest the glass either on edge or flat against a carpeted table. To help the cutting tool move smoothly across the glass, workers sometimes brush a thin layer of oil along the line of the intended cut.

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 cut just below the surface. Immediately after cutting, the glazier presses on the small end to break the glass cleanly along the cut.

Glaziers may use a crane to install 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 putty, rubber gaskets, metal clips, and metal or wood molding. When using putty, which is similar to very soft taffy, 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 then 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.

Glaziers sometimes use a rubber gasket—a very heavy molded rubber hose with a split running its length—to secure glass. They first glue 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 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 sash and attach locks and hinges to glass doors.

In addition to handtools such as glasscutters and putty knives, glaziers use power tools, such as cutters and grinders. They also use many types of sealants, mastics—a paste-like cement—and rubber moldings.

Working Conditions

When installing large pieces of glass, glaziers work in teams. They occasionally travel for a day or two to small towns 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. The physically demanding job requires a considerable amount of bending, stooping, lifting, and standing.

Glaziers maybe injured by glass edges or cutting tools, falls from scaffolds, or from lifting glass. To reduce injuries, employers and unions emphasize safety training.

Places of Employment

About 19,000 persons worked as construction glaziers in 1978. 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. In cities and towns with little construction activity, painters, paperhangers, and carpenters may do glazing work.

Training, Other Qualifications, and Advancement

The majority of construction glaziers learn the trade through a 3-year apprenticeship program. Others learn the trade informally on the job by assisting experienced workers.

Apprenticeship programs, which are ad-



Glaziers often set glass in place by hand.

ministered by local union-management committees, consist of on-the-job training as well as 144 hours of classroom instruction each year. Some apprenticeship programs also require a comprehensive home study course.

On the job, apprentices learn to use the tools and equipment of the trade; handle, measure, cut, and install glass; 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.

Those who learn this trade informally usually start by carrying glass and cleaning up debris in large glass shops. They often practice their cutting techniques on discarded glass. After a year or so, they may have an opportunity to cut glass for a job. Eventually,

helpers assist experienced workers on a simple installation job. Learning the trade this way may take considerably longer than through apprenticeship.

Local union-management committees determine how apprentices are recruited and selected. Applicants for apprenticeships must be in good physical condition and at least 17 years old. In some areas applicants must take mechanical aptitude tests and meet other requirements set by the local apprenticeship committee. 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 may advance to supervisory jobs. Some glaziers become contractors.

Employment Outlook

Employment of construction glaziers is expected to increase faster than the average for all occupations through the 1980's. Some openings also will arise as experienced glaziers retire, die, or leave the occupation for other reasons. Because this occupation is fairly small, only a limited number of openings will become available, and people interested in the trade may face competition for apprenticeships. Also, the number of job openings may fluctuate from year to year because employment in this trade is sensitive to changes in construction activity.

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.

Employment opportunities should be greatest in metropolitan areas, where most glazing contractors are located.

Earnings

In 1978, union construction glaziers in metropolitan areas had estimated average wages of \$10.40 an hour. In comparison the average hourly wage for production or non-supervisory workers in private industries, except farming, was \$5.69. 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.

Many glaziers employed in construction are members of the International Brotherhood of Painters and Allied Trades.

Related Occupations

Other workers who cut and install glass are auto-glass workers, glass installers, metal furniture glaziers, refrigerator glaziers, and safety-glass installers.

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. 863.381-010 and -014, and .664-010)

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. Selecting the proper material and method of installation is the responsibility of insulation workers.

Insulation workers—sometimes called applicators—may paste, wire, tape, or spray insulation to an appropriate surface. When covering a steam pipe, for example, insulation workers may cut a tube of insulation to the necessary length, stretch it open along a cut which 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. 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 some places such as 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 a simple task. The worker fills the machine with shredded fiberglass insulation, allows the compressor to force the insulation through a hose, and controls the direction and flow of the insulation 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.

Compressors for “blowing-in” or for “spraying-on” insulation also may be used. In using these tools, applicators may have to bend or squat while working on ladders or on scaffolds in dimly lit and sometimes very dusty areas.

Working Conditions

Insulation workers generally work indoors amidst 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. Removing old insulation before installing new materials is often dusty and dirty. Tearing out asbestos—at one time the



Insulation must be trimmed so it will fit over a pipe connection.

most common form of insulation but rarely used today—can be very dangerous. To protect themselves, they generally wear masks.

Places of Employment

Most of the 51,000 insulation workers employed in 1978 worked for insulation contractors. Others were employed to alter and maintain insulated pipework in chemical factories, petroleum refineries, powerplants, and similar structures which have extensive steam installations for power, heating, and cooling. These workers also maintain and repair cold-storage facilities for large firms. Very few insulation workers are self-employed.

Training, Other Qualifications, and Advancement

Almost all insulation workers learn their trade through either informal on-the-job training or a formal 4-year “improvership” program which is much like the apprenticeship programs of other trades; 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-in” insulation, supplying insulation to experienced workers, or holding the material while they fasten it in place. In about 6 to 8 months, assignments become more complex, and within a year a trainee usually learns to measure, cut, fit, and install various types of insulation. 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 improvership programs receive in-depth instruction in almost all phases of insulation. In-depth instruction is provided by and paid for by a joint committee of local insulation contractors and the local union of insulation applicators. The committee determines the need for improverships, screens and tests applicants, and ensures the availability of proper training programs. 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, and general construction provide a helpful background.

Applicants seeking 4-year improvership positions must have a high school diploma or its equivalent, and be at least 18 years old. Application can be made through local contractors, unions, or a joint committee.

Skilled insulation workers may advance to supervisor, shop superintendent, or insulation contract estimator.

Employment Outlook

Employment of insulation workers is expected to grow faster than the average for all occupations through the 1980's. In addition to jobs from increased demand for insulation work, openings will arise annually from the need to replace workers who transfer to other occupations, retire, or die.

More workers will be needed to install energy-saving insulation in new homes and businesses. 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.

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 \$10.90 an hour in 1978, or about twice the hourly rate paid to nonsupervisory and production workers in private industry, except farming. Apprentice wage rates start about half the rate paid to experienced workers and increase periodically.

According to limited information, experienced nonunion insulation workers earn from \$220 to \$325 per week. Nonunion trainees earn from \$140 to 160 per week.

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' improvership 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; or the nearest office of the State employment service or State apprenticeship agency.

Ironworkers

(D.O.T. 801.361-014, and .684-026; 809.381-022; 869.683-014)

Nature of the Work

Ironworkers erect steel framework and other metal parts in buildings, bridges, and other structures. They also rig heavy construction machinery (prepare it for moving) and deliver the machinery to new sites. In addition, ironworkers make alterations, such as installing steel stairs or adding window guards to buildings, and do repair work, such as replacing metal bridge parts.

Ironworkers comprise four related trades—structural ironworkers, riggers and machine movers, ornamental ironworkers, and reinforcing ironworkers. Many ironworkers are skilled in two or more of these trades.

Structural ironworkers (D.O.T. 801.361-014) erect, align, and fasten the steel framework of bridges, buildings, and other struc-

tures such as storage tanks. They also install floor decking and the doors and frames of bank vaults. Ironworkers follow blueprint specifications in erecting steel framework. They direct crane operators to hoist each steel part into proper position. Workers often push, pull, or pry beams and girders for last-second positioning before temporarily bolting them in place.

To correctly align and permanently connect a steel member, ironworkers use plumb bobs, levels, and measuring tapes. They remove any temporary bolts and jockey the steel beam or girder into position with winches, hoists, and jacks. Workers then bolt, rivet, or weld the correctly aligned member to others for final fastening. In constructing a large building, ironworkers generally specialize in a particular operation such as welding or riveting.

Riggers and machine movers (D.O.T. 869-683-014) set up and rig the hoisting equipment used to erect and dismantle structural steel frames. These skilled workers also move heavy construction machinery and equipment. They study the size, shape, and weight of the object to be moved, choose lines and cables to support its 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. In many instances, riggers build platforms or containers on the job to move unusually shaped materials and machines. This work requires a knowledge of hoisting equipment and lifting devices.

Ornamental ironworkers (D.O.T. 809.381-022) install metal stairways, catwalks, floor gratings, ladders, metal cabinets, and window frames. They also install lamp posts, fences, and decorative ironwork. In addition, they bolt or weld prefabricated aluminum, brass, and bronze frames and panels to buildings.

Since other workers cut and shape most of the ornamental metal away from the construction site, 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.

Reinforcing ironworkers (D.O.T. 801.684-026) set steel rods or bars in concrete forms to reinforce the concrete. They place the steel bars on suitable supports in the concrete form, tie the bars together by wrapping and twisting wire around them, and then cut them to the required length, if necessary, with a hacksaw or an acetylene torch. Workers follow supervisory instructions or blueprint specifications to make sure the reinforcing rods are positioned properly. Some concrete is reinforced with a coarse mesh made of welded wire. When using mesh,

ironworkers 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, ironworkers use hooked rods to position the wire mesh in the freshly poured mixture.

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 usually are not required to work when it is wet or extremely windy.

These workers also risk injury from falls. However, in recent years, accidents have been reduced considerably through the use of safety devices such as nets, safety belts, and scaffolding.

Ironwork can involve considerable travel, because the amount of work available locally may be insufficient to keep crews continually employed.

Places of Employment

About 78,000 structural and ornamental ironworkers were employed in 1978. Thousands of additional workers were employed as riggers, machine movers, and reinforcing ironworkers.

Most of these workers are employed by general contractors on large building projects, steel erection contractors, or ornamental iron contractors. Many 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 work in all parts of the country, but most work in metropolitan areas.

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 learn informally by working as helpers to experienced ironworkers.

Apprenticeship programs, many of which are sponsored by local union-contractor agreements, usually consist of 3 years of on-the-job training and a minimum of 144 hours a year of classroom instruction in subjects such as drafting, blueprint reading, and mathematics applicable to layout work. Apprentices learn ornamental assembling, reinforcing rigging, structural erecting, and welding. On the job, apprentices are taught care and safe use of tools, equipment, and materials commonly used in the trade.

Those who learn the trade informally usually start by moving materials—hauling rods and disposing of debris. Within a short period they can set reinforcing rods. Eventually, they do ornamental or structural work.



Ironworkers assemble rods that will be used in making concrete pillars.

Applicants for apprenticeship or helper positions generally must be at least 18 years old, be in good physical condition, and have a high school or vocational school education; courses in general mathematics, mechanical drawing, and shop provide a helpful background.

Since materials used in ironworking trades are heavy and bulky, above-average physical strength is necessary. Agility and a good sense of balance also are required in order to work at great heights and on narrow footings.

Experienced ironworkers can advance to supervisory positions. A small number go into their own ironworking business.

Employment Outlook

Employment of ironworkers is expected to increase faster than the average for all occupations through the 1980's. Growth in construction activity will increase the demand for these workers. Besides jobs resulting from employment growth, 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 may fluctuate from year to year, however, because construction activity is sensitive to changes in the economy.

Employment in all ironworking occupations is expected to increase over the long run. The greater use of structural steel in buildings will create a need for more structural ironworkers. Work opportunities for ornamental ironworkers will result from the growing popularity of ornamental panels for large buildings, and of metal frames to hold large glass installations. More riggers and machine movers will be needed to handle the increasing amount of heavy construction machinery. Increased demand for prestressed

concrete will create additional job opportunities for reinforcing ironworkers.

Job openings for ironworkers usually are more abundant during the early spring when the weather warms up and the level of construction activity increases.

Earnings

Structural and reinforcing ironworkers in the largest metropolitan areas earned estimated average wages of \$10.85 an hour in 1978, or about twice the average wage of nonsupervisory and production workers in private industry, except farming. Apprentices start at 60 percent of the hourly rate paid to experienced workers. They receive increases as they gain experience. Annual earnings for these workers, 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 fluctuations in construction activity.

Many workers in these trades are members of the International Association of Bridge, Structural and Ornamental Iron Workers.

Related Occupations

Ironworkers join, align, and fasten structural parts. Other occupations which entail similar work include fitters, assemblers, and welders.

Sources of Additional Information

For more information on apprenticeships or other work opportunities, contact local general 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 ironworkers, contact:

Associated General Contractors of America, Inc.,
1957 E St. NW., Washington, D.C. 20006.

Lathers

(D.O.T. 842.361-010)

Nature of the Work

What makes cement cling to a ceiling? Lath does! If properly installed, lath creates a firm support to which wet cement, plaster, or stucco will hold fast to form ceilings and walls. The one who installs lath is called a lather.

Until the last century, lath was made exclusively of wood. Since then, metal and gypsum have replaced wood because of their versatility, strength, and fireproofing properties. Metal lath comes in different forms, but it is usually wire mesh. Gypsum lath comes in 1/2 inch thick sheets, ranging from 1 1/4 feet by 4 feet to 4 feet by 8 feet.

Each type of lath holds cement, plaster, or stucco in a particular way. For example, wet plaster penetrates openings in the lath and is held in place mechanically. When applied to gypsum lath, however, chemicals in the wet plaster react with other chemicals on the lath's surface, bonding the materials together.

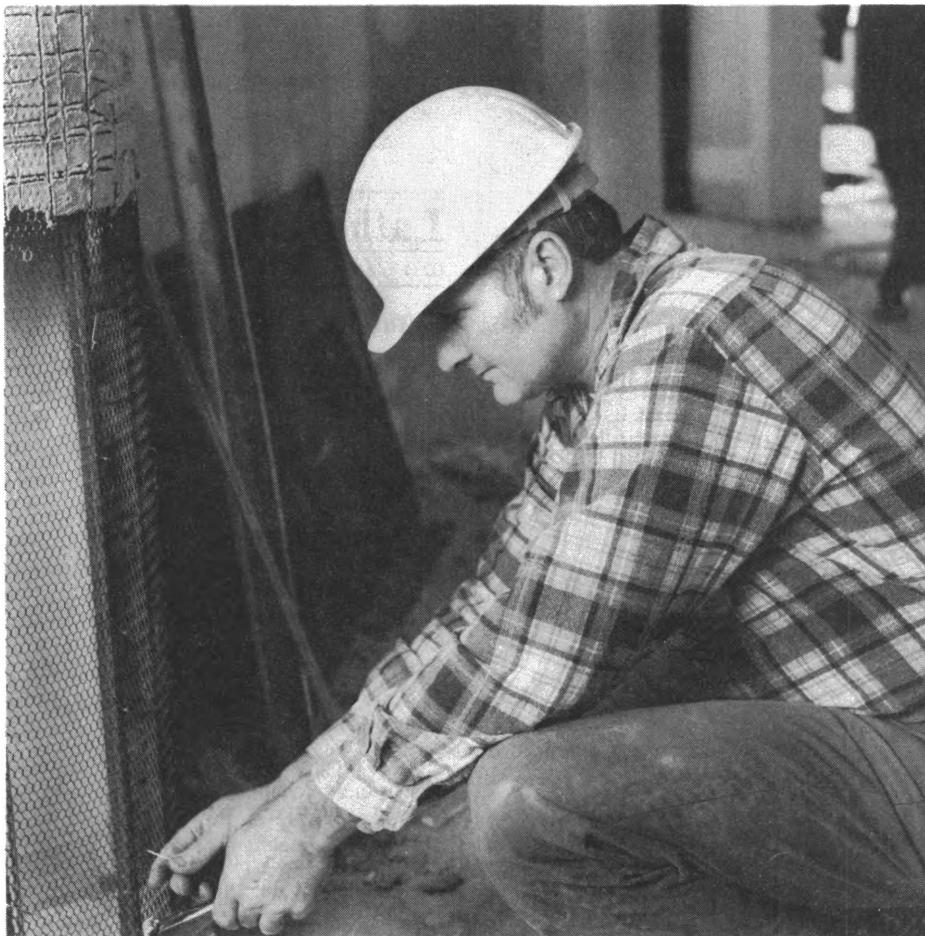
Lathers use various methods of installation depending on the purpose of the job, the kind of building, and the type of lath specified. On walls and ceilings, lathers usually clip, nail, screw, staple, or wire-tie the lath directly to the building's framework. On cinder block or masonry walls, they build a light metal or wood frame, called furring, onto the building's structure; then attach the lath to the furring. While installing lath, workers cut openings in it for electrical outlets and water pipes.

Lathers install a special wire mesh reinforcement on inside angles and corners or walls to prevent cracking. On outside or exposed corners, they attach a corner support that provides protection and strength.

Sometimes two layers of lath are installed. For example, when stucco (a mixture of portland cement and sand) is applied over a wood framework, workers may install two layers of wire mesh, separated by a layer of felt, as a base for the stucco.

In ornamental or curved surface work, workers build a frame approximating the desired shape, and then attach the lath to the frame.

Lathers also install suspended ceilings. They wire-tie metal bands to rods or wires attached to the structure above. Installers crisscross metal bands horizontally across the room, to form rectangular spaces. These spaces can hold either ceiling panels or lath to which plaster is applied.



A lather ties metal lath to a post.

To do their work, lathers use drills, hammers, hacksaws, shears, wirecutters, hatchets, stapling machines, and power-actuated fastening devices.

Working Conditions

Lathers generally work indoors amidst the clutter of construction. Although the work is not strenuous, it does require standing, squatting, or working overhead for long periods. Workers can fall from scaffolds or receive cuts from working materials or tools, but the occupation is not considered hazardous.

Places of Employment

Most lathers—who numbered about 23,000 in 1978—work for lathing and plastering contractors on new residential, commercial, or industrial construction. They also work on modernization and alteration jobs. A relatively small number of lathers are employed outside the construction industry; for example, some make the lath backing for plaster display materials or scenery.

Training, Other Qualifications, and Advancement

Most training authorities recommend apprenticeship as the best way to learn lathing. However, many lathers, particularly in small communities, have acquired their skills infor-

mally by working as helpers, observing or being taught by experienced lathers.

Apprenticeship programs usually last a minimum of 2 years, and are usually sponsored by various local joint labor-management committees. All programs include on-the-job training; some also include classroom instruction. On the job, under the guidance of an experienced worker, apprentices learn to use the tools and materials of the trade. Initially, they work on simple tasks, such as nailing gypsum lath to wall partitions. After gaining experience, they advance to more complex jobs, such as installing wire mesh on curved surfaces. Classroom instruction includes applied mathematics, blueprint reading, sketching, estimating, basic welding, and safety.

Informal on-the-job training provides only the essential knowledge trainees need. They start with easy jobs such as carrying materials or holding lath in place for experienced workers. Trainees soon learn to clip, nail, staple, and wire-tie the lath—first, to walls and later, to floors and ceilings.

Generally, applicants for apprenticeship or helper positions should be at least 16 years old, in good physical condition, and licensed to drive. Apprenticeship applicants are usually required to have a high school or vocational school education, or the equivalent. Courses in general mathematics and mechan-

ical drawing can provide a helpful background. Aptitude tests often are given to determine manual dexterity and mechanical ability.

Some experienced lathers may become supervisors. Others may start their own lath contracting business.

Employment Outlook

Little change in the employment of lathers is expected through the 1980's. Although some jobs will result from the need to replace workers who retire, die, or leave the occupation for other reasons, the number of lathers is small and there will be relatively few job openings annually.

While population and business growth will stimulate the construction of new and the renovation of old buildings, it is expected to have little impact on the demand for lath and lathers. Some lathers will be needed to construct more expensive new buildings, to renovate older buildings, and to provide lath for curved surfaces. However, drywall—which is a good substitute for and is less expensive than lath and plaster—has been growing rapidly in popularity as a wall covering material. As a result, the demand for drywall installers has increased while the demand for lathers has declined.

Earnings

In 1978, lathers in the largest metropolitan areas had estimated average wages of \$10.05 an hour or about twice the average wage of nonsupervisory workers in private industry, except farming. Apprentices and other trainees start at about 50 percent of the wage rate paid to experienced lathers and receive more as they gain experience. Since poor weather and fluctuations in construction activity adversely affect yearly earning, lathers and apprentices generally earn less than hourly rates would indicate.

A large proportion of lathers are members of the Wood, Wire and Metal Lathers International Union.

Related Occupations

To fabricate structures, lathers combine manual skills and the ability to follow blueprints and work within precise limits. Other occupations involving similar skills include air-conditioning installers, carpet layers, fence erectors, riveters, and roofers.

Sources of Additional Information

For information about lathers' apprenticeships or other work opportunities in the trade, contact a local lathing or plastering contractor; a local of the Wood, Wire and Metal Lathers International Union; a local joint labor-management apprenticeship committee; or the nearest office of the State employment service or apprenticeship agency.

For general information about the work of lathers, contact:

Association of the Wall and Ceiling Industries-

International, 1711 Connecticut Ave. NW., Washington, D.C. 20009.

National Lathing Industries Joint Apprenticeship Program, 815 16th St. NW., Washington, D.C. 20006.

Operating Engineers (Construction Machinery Operators)

(D.O.T. 850.663-014, -022, and -026; 850.683; 851.663-010; 853.663-010 and 014; 853.683-010, -014, and -018; 859.683 exc. -014)

Nature of the Work

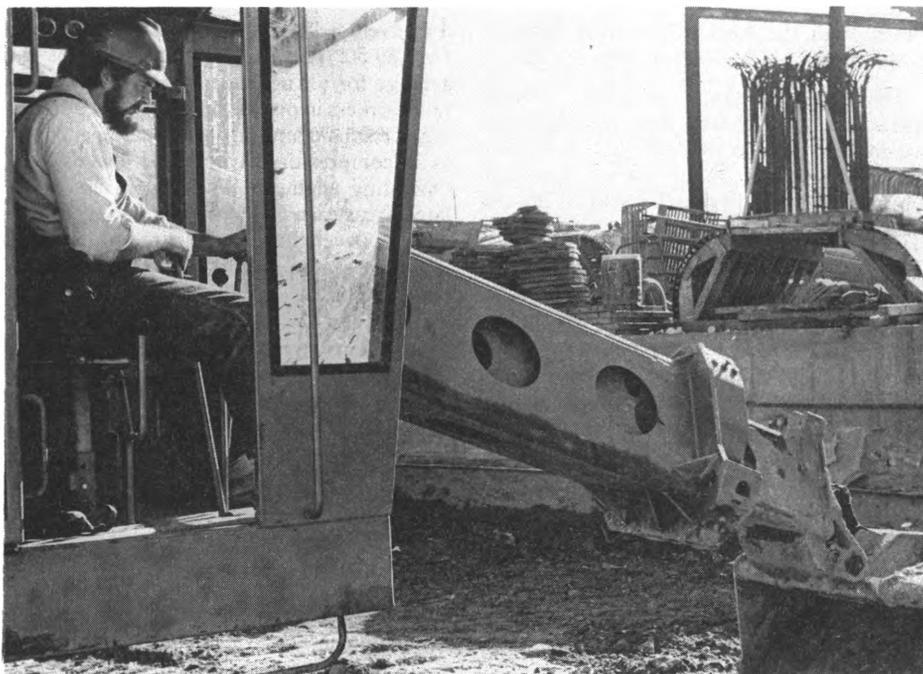
Lifting and positioning a quarter-ton pane of glass by crane into an 8-foot by 10-foot window opening 10 stories above the ground requires considerable skill. At the crane's controls is an operating engineer. Operating engineers also work the controls of bulldozers, trench excavators, paving machines, and many other types of construction machinery. Some workers know how to operate many kinds of machines; others, only a few. Because the skills and training required vary, operating engineers usually are classified by either the type or the capacity of machines they operate.

Heavy machines are usually complex and difficult to operate. A large crane, for example, requires a high degree of skill. Operators 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 crane, raise and lower its boom and loadline, or open and close attachments such as steel-toothed buckets to lift dirt or clamps to lift materials. At times, operators may not see either the pickup or delivery point and must follow the hand or flag signals of another worker.

Medium-sized equipment, on the other hand, usually requires less skill to operate. Bulldozer operators, for example, generally handle fewer controls than crane operators, and since the "dozer" operator works at ground level, estimating distances is less of a problem.

Like driving a car, operating a bulldozer can be a relatively simple task. The huge "blade" attached to the front can be raised or lowered by pushing a button or by pushing or pulling a lever. To clear land, a bulldozer operator simply 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.

Of the three weight classifications, light equipment such as an air compressor is the easiest to operate and, therefore, requires the least skill.



Operating engineers must judge distances accurately.

Before starting an air compressor (a diesel engine that takes in air and forces it through a narrow hose), 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 run special "air" tools. 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 for easy engine starting the next time it is to be used.

Operating engineer helpers, sometimes called "oilers," make sure the machines have 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; consequently, they usually work steadily during the warmer months and experience slow periods during the colder months. Time also may be lost due to 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 operators and may subject them to high noise levels.

Places of Employment

Approximately 580,000 operating engineers were employed in 1978. An estimated 300,000 operated excavating, grading, and

road machinery; about 120,000 worked as bulldozer operators; and nearly 160,000 operated other construction machinery, including cranes, derricks, hoists, air compressors, trench-pipe layers, and dredges.

Most operating engineers work for contractors in highway, dam, airport, and other large-scale construction projects. Others work 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. Some engineers operate cranes, hoists, and other power-driven machinery in factories and mines. Less than one-tenth are 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 on highways and dams being built in remote locations.

Training, Other Qualifications, and Advancement

Apprenticeship programs are not as numerous for operating engineers as for other construction crafts. For this reason, many individuals learn the trade by beginning as truckdrivers, helpers, or as operators of light equipment such as an air compressor. 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 medium-sized and heavy 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. Less extensive training is availa-

ble through the Armed Forces or through special heavy-equipment training schools.

The apprenticeship program, usually sponsored through a union-management committee but also available in the Armed Forces, consists of at least 3 years of on-the-job training and 144 hours a year of related classroom instruction.

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.

For apprentice jobs, employers prefer to hire high school or vocational 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 schools offer instruction in the operation of certain types of construction equipment. Persons considering such training should contact construction employers in the area to determine the school's performance.

Operating engineers need to be alert and have a good sense of balance as well as good eye-hand-foot coordination and physical strength.

Operating engineers who have leadership ability may become supervisors, but opportunities are few. Some operating engineers start their own excavating and grading businesses.

Employment Outlook

Job opportunities for operating engineers should be fairly plentiful over the long run. Employment in this occupation is expected to grow faster than the average for all occupations through the 1980's. Population and business growth will lead to the construction of more factories, mass transit systems, office buildings, powerplants, and other structures. More operating engineers also will be needed in maintenance work on highways and for materials movement in factories and mines.

Besides the job openings created by employment growth, many openings will arise as experienced operating engineers retire, die, or leave the occupation for other reasons. Jobs should be easiest to find during spring and summer since construction picks up as the weather becomes warmer. However, because construction activity is sensitive to ups and downs in the economy, the number of job openings may fluctuate from year to year.

Earnings

Wage rates for operating engineers vary according to the machine operated. In the largest metropolitan areas, estimated hourly rates in 1978 for excavating machine opera-

tors averaged \$10.07; for bulldozer operators, \$9.50. 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.

Related Occupations

Other occupations in which workers operate equipment to move materials include conveyor operators, cement loaders, drop operators, boat-hoist operators, and stevedores.

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 joint 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.

Painters and Paperhangers

(D.O.T. 840.381-010 and 841.381-010)

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. Painting and paperhanging are separate, skilled trades although some people do both types of work. Painters apply paint, varnish, and other finishes to building surfaces. Paperhangers cover walls and ceilings of rooms with decorative wallpaper, fabric, vinyl, or other wall coverings.

The first step in painting is to prepare the surface to be covered. Painters sand, scrape, or burn away old paint so that the new paint will adhere properly. If the paint is difficult to remove, they loosen it with chemicals or

special equipment before sanding. They 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 sealer to make a suitable surface for the finish coat.

Painters must be skilled in handling brushes and other painting tools so that they can apply paint thoroughly, uniformly, and rapidly to any type of surface such as wood, concrete, metal, masonry, plastic, or drywall. They must be able to mix paints and match colors, using a knowledge of paint composition and color harmony. They also must know the characteristics of common types of paints and finishes from the standpoints of durability, ease of handling, and application.

Painters often use rollers or spray guns instead of brushes. Rollers are used on even surfaces such as walls and ceilings. Spray guns are used on surfaces that are difficult to paint with a brush, such as cinder block and metal fencing. Both rollers and spray guns permit faster painting.

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), which they use when working on tall buildings and similar structures.

The first step in paperhanging 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 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 contract construction as a whole.



Painters must work quickly and neatly.

Places of Employment

About 484,000 painters and 20,000 paperhangers were employed in 1978. 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 employed maintenance painters.

A high proportion of workers in these trades are in business for themselves. About one-fourth of the painters and more than two-thirds of the paperhangers are self-employed. In comparison, 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 the completion of a formal apprenticeship as the best way to become a painter or paperhanger. The advantage of apprenticeship is that trainees are guaranteed a set period of training in each skill of the trade. However, apprenticeship opportunities are limited, and many new workers begin as helpers to experienced painters. Few opportunities for in-

formal 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 generally 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 in an apprenticeship or informal, 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 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 jobs as cost estimators for painting and decorating contractors. Some may become supervisors, or they may establish their own painting and decorating businesses.

Employment Outlook

Employment of painters is expected to grow more slowly than the average for all occupations through the 1980's. In addition to employment growth, many new workers will be hired to replace experienced painters who retire, die, or leave their jobs for other reasons. Over the long run, population and business growth will create a rising demand for new houses and buildings and more workers will be needed to paint these structures. Additional workers also will be hired to repaint existing structures. The number of job openings, however, may vary greatly from year to year as well as within any given year because the demand for painters is sensitive to fluctuations in construction activity caused by economic and seasonal conditions.

Employment of paperhangers is expected to increase more slowly than the average for all occupations through the 1980's. The demand for these workers should be stimulated by the rising popularity of wallpaper and more durable wall coverings such as vinyl. Since this is a relatively small trade, however, job openings for paperhangers will be far less numerous than those for painters.

Earnings

Based on a survey of the largest metropolitan areas, hourly rates for construction painters and paperhangers averaged about \$9.38 in 1978. In comparison, the average rate for nonsupervisory or production workers in private industry, except farming, averaged \$5.69 an hour. Hourly rates for maintenance painters ranged from \$6 to \$8.50 in 1978. Annual incomes for some 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.

Plasterers

(D.O.T. 842.361-018 and -026, and .381-014)

Nature of the Work

Plasterers finish interior walls and ceilings with plaster coatings that form fire-resistant and relatively soundproof surfaces; they apply durable cement plasters or stucco to exterior surfaces. Plasterers also cast ornamental designs in plaster.

To interior surfaces such as cinder block or 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. However, when the foundation consists of metal lath (a supportive wire mesh), plasterers apply a preparatory coat to the lath.

When applying a 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 first or "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 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 dries very quickly, produces a very thin, very 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.

For exterior work, plasterers apply a scratch coat to wire lath in the same way that they plaster interior surfaces. To the exterior scratch coat, workers usually apply a gritty mixture of white cement and sand—stucco—to produce a durable final coat. As an alternative, they plaster an extra heavy mixture over the scratch coat, then embed marble or gravel chips about halfway into the mixture to achieve a uniform, pebblelike surface.

Plasterers sometimes do complex decorative and ornamental work which 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 or ladders high above the ground to finish walls and ceilings.

Plastering is very physically demanding—requiring considerable standing, stooping, and lifting.

Places of Employment

Plasterers—who numbered about 28,000 in 1978—worked mostly on new construction and alteration work, particularly where special architectural and lighting effects were part of the job. Some plasterers repaired older buildings.

Most plasterers worked for independent contractors. About 1 out of every 5 plasterers was 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 or laborers, observing and being taught by experience 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 of annual classroom instruction in drafting, blueprint reading, and mathematics for layout work. However, individuals who show exceptional ability may complete the programs in less time. In class, apprentices start with a history of the trades 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. Trainees follow the directions of and receive assistance from experienced plasterers. 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 gain only the basics—mixing and applying plasters. They 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.

Employment 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 retire, die, or transfer to other occupations. 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. Since plaster insulates better than drywall, there may be a resurgence in demand for plaster on the part of both house buyers and builders. In addition, plasterers will be needed for renovating older buildings that have plaster walls and in other buildings



Plasterer applies scratch coat onto base molding.

where there are curved surfaces and drywall materials are not practical. Because construction activity is sensitive to the ups and downs in the economy, job openings for plasterers may fluctuate greatly from year to year.

Earnings

Union wage for plasterers in metropolitan areas averaged about \$10.56 an hour in 1978 or about twice the average wage of all non-supervisory 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 and increase 10 percent every 6 months. However, yearly earnings for plasterers and apprentices are generally lower than hourly rates would indicate because the annual number of hours that they 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-manage-

ment apprenticeship committee; 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.

Association of Wall and Ceiling Industries—International, 1711 Connecticut Ave. NW., Washington, D.C. 20009.

Operative Plasterers' and Cement Masons' International Association of the United States and Canada, 1125 17th St. NW., Washington, D.C. 20036.

Plumbers and Pipefitters

(D.O.T. 862.261-010, .281-010, .361-014, and .381-010, -014, -018, and -030)

Nature of the Work

Plumbers and pipefitters install pipe systems that carry water, steam, air, or other liquids or gases. They also maintain, alter and repair existing piping systems and install plumbing fixtures, appliances, and heating, air conditioning, and refrigeration equipment.

Although plumbing and pipefitting are sometimes considered a single trade, workers can specialize in either craft. Plumbers install water, gas, and waste disposal systems in homes, schools, factories, and other buildings. Pipefitters, on the other hand, install both high- and low-pressure pipes that carry hot water, steam, and other liquids and gases for use in industrial and commercial processes. For example, pipefitters install the

complex pipe systems in oil refineries and in chemical processing and nuclear power plants.

In each of these trades, installation techniques are similar because they all involve pipes, faucets, and valves, and problems encountered in one trade are similar to those in another.

Most pipes are steel, copper, cast iron, or some other metal; others may be plastic, glass, or other nonmetallic material. Although some iron pipes come ready to install, most pipes have to be "fitted" for the job. To fit pipes, workers may have to measure, bend, cut, and thread pipes; then bolt, braze, solvent weld, screw, or solder them together.

For cutting, workers use a pipecutter. This long-handled tool has a set of rollers and steel-cutting wheels. Workers separate the wheels' edges, set the pipe between them, then tighten the wheels against the pipe. Tightening causes the sharp edges of the wheels to cut just into the pipe's surface on opposite sides. Using the handle for leverage, workers rotate the tool, causing the steel wheels to cut a groove in an exact line around the pipe. To cut entirely through the pipe, workers repeatedly tighten the wheels and rotate the tool around the pipe.

Occasionally workers bend pipes to fit around obstructions. To bend a pipe, workers fasten it securely within a bending device at or near the point of the intended bend, then apply pressure to one end of the pipe.

Workers install and connect pipes and fittings according to the instructions on blueprints or shop drawing. They may have to drill holes in ceilings, floors, and walls, or hang steel supports from ceilings to position the pipes properly.

After setting the pipes in place, workers connect them. They insert the end of a pipe into the slightly larger end of a valve or properly shaped connector. Workers then may use wrenches to screw threaded pipes tightly together, or may solvent weld, or solder connections to prevent leaks. To connect large pipes, such as those in buildings or industrial plants, workers bolt together the raised collars on the ends of pipes and valves.

Some plumbers and pipefitters specialize in gas, steam, or sprinkler fitting. Gasfitters install and maintain the fittings and extensions that connect gasoline mains with lines leading to buildings. Steamfitters assemble and install steam or hot water systems for commercial and industrial uses. Sprinkler fitters install and maintain the piping for fire extinguishing systems.

Plumbers and pipefitters use wrenches, reamers, drills, braces and bits, hammers, chisels, saws, and other handtools. They use hand-operated hydraulic pipe benders or power machines to cut, bend, and thread pipes. In addition, plumbers and pipefitters use gas or acetylene torches, arc welders, and other welding, soldering, and brazing equipment.



Plumbers repair as well as install pipe systems.

Working Conditions

Plumbing and pipefitting work is sometimes strenuous. These workers frequently must stand for long periods and occasionally work in cramped or uncomfortable positions. They risk the danger of falls from ladders, cuts from sharp tools, and burns from hot pipes. The injury rate for employees of plumbing, heating, and air-conditioning contractors has been higher than the average for employees of manufacturing firms. However, most injuries in the trade are not severe.

Places of Employment

Most plumbers and pipefitters—who numbered about 428,000 in 1978—work for plumbing and pipefitting contractors engaged in new construction or repair, alteration, or modernization work. A substantial proportion of plumbers are 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, 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, and observing and receiving instruction from them.

Most apprenticeship programs for plum-

bers and pipefitters are sponsored through union-management agreements and usually consist of 4 years of on-the-job training, in addition to at least 216 hours annually of related classroom instruction. Subjects include drafting and blueprint reading, mathematics applicable to layout work, applied physics and chemistry, and local plumbing codes and regulations.

On the job, helpers and apprentices begin with simple tasks such as carrying materials and cleaning up debris. In a short time they learn to measure and cut pipe, and later to bend, thread, and connect it. Welding, the most difficult form of connecting pipe, is taught toward the end of training. In the final phase of training, helpers and apprentices may learn to estimate costs.

Applicants for apprentice or helper jobs generally are required to be at least 18 years old and in good physical condition. A high school or vocational school education generally is recommended. Courses in chemistry, general mathematics, mechanical drawing, physics, and shop are helpful. Applicants may be given tests to determine whether they have the mechanical aptitude required in these trades. To obtain a plumber's or pipefitter's license, which some communities require, individuals must pass a special examination to demonstrate knowledge of the trade and of local plumbing codes.

Some plumbers and pipefitters may become supervisors for plumbing and pipefitting contractors. Many go into business for themselves. As they expand their activities, they may employ other workers and become contractors. In most localities, contractors are required to obtain a master plumber's license.

Employment Outlook

Employment of plumbers and pipefitters is expected to grow as fast as the average for all occupations through the 1980's. Thousands of job openings are expected because of employment growth and the need to replace plumbers and pipefitters who retire, die, or stop working for other reasons.

Employment is expected to grow mainly as a result of anticipated increases in construction. Furthermore, plumbing will become more important in many types of construction. For example, a larger proportion of homes will have air-conditioning, solar heating, and appliances such as kitchen waste-disposals. Chemical and petroleum refineries and coal gasification and nuclear powerplants, which use pipe extensively in processing, are expected to expand and create additional jobs for plumbers and pipefitters. Maintenance, repair, and modernization of existing plumbing or piping systems also will create employment opportunities.

Earnings

According to a survey of the largest metropolitan areas, wage rates for plumbers and for pipefitters in construction averaged \$10.10 an hour in 1978. In comparison, the average wage for nonsupervisory and production workers in private industry, except farming, was \$5.69. 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 systems of pipe are marine pipe fitters, coppermiths, furnace installers, diesel engine pipe fitters, and heating and air-conditioning mechanics.

Sources of Additional Information

For information about apprenticeships or work opportunities in these trades, contact local plumbing, heating, 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 State apprenticeship agency.

For general information about the work of plumbers, pipefitters, and sprinkler fitters, contact:

National Association of Plumbing-Heating-Cooling Contractors, 1016 20th St. NW., Washington, D.C. 20036.

National Automatic Sprinkler and Fire Control Association, P.O. Box 719, Mt. Kisco, N.Y. 10549.

Roofers

(D.O.T. 866.381-010)

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, slate shingles, and tiles. These workers also may waterproof walls and floors.

There are basically 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. The nature of the roofer's work varies with the type of roof and the type of roofing involved. Most flat roofs are covered with several layers of materials. Roofers first spread a coat of hot tar over the roof's insulation. Next they lay roofing felt (fabric soaked in tar) over the entire surface. The roofers then apply hot tar 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 tar over the surface. Finally, they add gravel, which sticks firmly to the top.

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 the 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 damp-proof 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 tar. In fact, the accident rate in the roofing industry is the highest in

all contract construction. Roofers work outdoors in all types of weather, particularly when making repairs. Roofs are extremely hot during the summer.

Places of Employment

About 114,000 roofers were employed in 1978. 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 1 out of every 4 roofers was self-employed.

Training, Other Qualifications, and Advancement

The majority of roofers acquire their skills informally by working as helpers for experienced roofers. However, a 3-year apprenticeship program—usually administered by a local union-management committee—generally provides the most thorough training for this trade.

Helpers learn the trade on the job. They start by carrying equipment and material and by 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. After a year or so, they may learn to lay and fit tile, and eventually slate.

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 work on certain areas of roofing for a specified time. They 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.

Roofers may advance to supervisor for a roofing contractor; some become contractors themselves.

Employment Outlook

Employment of roofers is expected to increase as fast as the average for all occupations through the 1980's. More roofers will be needed as new homes, stores, and factories are built. Repairs to existing roofs also will create work for roofers. The need to replace experienced roofers who retire, die, or stop working for other reasons will result in additional job openings. Because construction activity fluctuates, however, openings may be plentiful in some years, scarce in others. Jobs



Roofers often work with hot, sticky substances such as tar.

should be easiest to find during spring and summer since most roofing work is done when the weather is good.

Earnings

In 1978, roofers in the largest metropolitan areas had estimated average wages of \$9.60 an hour. In comparison, the average hourly rate paid to nonsupervisory or production workers in private industry, except farming, was \$5.69. 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, tar and gravel, or other materials. In many occupations workers cover walls, ceilings, and floors with special materials for protection and decoration. These occupations include acoustical carpenters, composition-weatherboard appliers, dry-wall applicator 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. 804.281-010)

Nature of the Work

Sheet-metal workers fabricate and install sheet-metal ducts for air-conditioning, heating, and ventilating systems; flat metal for kitchen walls and counters; and stamped metal for roofing and siding. They also install roof gutters and downspouts for rainwater drainage and make skylights and vents for industrial buildings. Some workers specialize in either shopwork or onsite installation; others do both.

Sheet-metal workers fabricate much of the metal at the shop. Working from blueprint specifications, they measure, cut, bend,

shape, and fasten most of the pieces that will be used on the job. Tapes and steel rulers are used for measuring; hand shears, hack saws, and power saws for cutting; and specially designed, heavy steel presses for cutting, bending, and shaping. Once the metal is measured and cut, workers then bolt, cement, rivet, solder, or weld the seams and joints together to form ducts, pipes, tubes, and other items.

At the construction site, sheet-metal workers usually just assemble and install pieces fabricated at the shop. Sometimes, however, workers use hammers, shears, and drills to make parts by hand at the worksite.

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, glue, or solder or use specially formed sheet-metal for connections.

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 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 properly functioning.

Working Conditions

Many sheet-metal workers do fabricating and layout work primarily in shops. Others work either indoors or outdoors at the con-

struction site. Sheet-metal workers generally work more regularly than most construction trades because most work is done indoors.

When installing gutters and skylights, they work high above ground. When installing ventilation and air-conditioning systems, they are required to do a considerable amount of bending, lifting, standing, and squatting in close quarters or in awkward positions. Sheet-metal workers risk cuts and burns from materials and tools. The injury rate for workers in this trade is higher than the average for all construction workers.

Places of Employment

Sheet-metal workers in the construction industry—who numbered about 70,000 in 1978—are employed mainly by contractors who specialize in heating, refrigeration, air-conditioning and air pollution equipment, and by general contractors engaged in residential, industrial, and commercial building. Additional 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 trades, the vast majority of sheet-metal workers learn their trade through apprenticeship programs. Some acquire their skills by working as helpers, observing and being taught by experienced workers.

The apprenticeship program usually consists of 4 years of on-the-job training, in addition to related classroom instruction. On the



To insure proper fit, sheet-metal workers make corrections at the job site.

job, apprentices learn to use the tools, machines, equipment, and materials of the trade. In the first 2 years, they learn to measure, cut, bend, fabricate, and install sheet-metal. They begin with duct work and gradually advance to fabricating decorative pieces. Toward the end of their training, they learn to use materials such as plastics and acoustical tile, which may be substituted for metal on some jobs. Trainees spend considerable time in the classroom learning drafting, blueprint reading, applied mathematics, 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 their costs as well as 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. Apprentices should have a high school or vocational school education or equivalent education. Courses in mathematics, 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.

Employment Outlook

Employment of sheet-metal workers in construction is expected to increase faster than the average for all occupations through the 1980's. In addition to jobs from employment growth, many openings will arise as experienced workers retire, die, or leave work for other reasons.

As population and business grow, 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. The demand for air-conditioning systems in older buildings as well as the need to make existing systems more energy efficient also will boost employment growth. Prefabrication is not likely to have much of an effect on this occupation because most sheet-metal work has to be custom-made according to the needs of a particular job.

Although employment is expected to increase over the long run, job openings may fluctuate from year to year due to ups and downs in construction activity. When construction activity is depressed, jobs for sheet-metal workers may be available in other industries.

Earnings

Sheet-metal workers in the largest metropolitan areas had estimated average wages of \$10.39 an hour in 1978. This is 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 receive periodic pay raises.

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 fabricator-assemblers of metal products; all-round machinists; metal patternmakers; and ornamental ironworkers.

Sources of Additional Information

For more information about apprenticeships or other work opportunities, contact local sheet-metal contractors or heating, refrigeration, or 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., Tyson's Corner, Vienna, Va. 22180.

Tilesetters

(D.O.T. 861.381-054)

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 screenlike 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.

Although workers are subject to cuts from tools or materials, falls from ladders, and strained muscles, the occupation is not considered hazardous.

Places of Employment

Tilesetters—who numbered about 33,000 in 1978—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 apply 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 off finished tile. Depending on the employer, a helper may learn to 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 voca-



About 1 out of 4 tilesetters is self-employed.

tional 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.

Skilled tilesetters may become supervisors or start their own contracting businesses.

Employment 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 is 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 bathrooms and the growing use of tile in kitchens also will spur employment in this trade.

Earnings

According to estimates of union wages in metropolitan areas in 1978, hourly rates for tilesetters averaged \$10.70, or about twice the hourly rate paid to nonsupervisory and production workers in private industry, except farming. Hourly wage rates for apprentices start at about 50 to 60 percent of the rate paid to union workers and increase periodically.

The principal unions organizing these

workers 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 Contractors' Association of America, Inc., 112 North Alfred St., Alexandria, Va. 22314

OCCUPATIONS IN TRANSPORTATION ACTIVITIES

The transportation industries offer a wide range of career opportunities. Jobs in air, rail, highway, and water transportation vary from those that require little education to technical and administrative positions that require at least a college degree.

Although this field includes a variety of jobs, over two-fifths of the workers provide transportation, by driving buses, trucks, and cabs; flying aircraft; or operating trains and ships. The rest provide a variety of support services. For example, some employees deal directly with customers—flight attendants

and reservation agents assist airline passengers and railroad station agents arrange to transport cargo for businesses. Other workers, such as airplane mechanics, truck mechanics, and railroad shopworkers, keep transportation equipment in good working condition.

As our economy expands and population grows, demand for freight and passenger service will rise, and more transportation workers will be needed. Employment trends will vary among the different modes of transportation, however. Employment in most air and

highway transportation jobs will increase, while employment in the merchant marine and in most jobs within the railroad industry will decline. Even in most declining occupations, however, new workers will be hired to replace those who retire, die, or transfer to other fields.

The transportation occupations mentioned in this introduction, as well as many others, are described in detail in the following sections.

Air Transportation Occupations

Air transportation offers excellent opportunities for persons of varying skills, training, and experience. Working conditions generally are good and the pay is fairly high. In addition, many employees have an opportunity to travel, either on the job or because they are entitled to fly at reduced fares on most airlines.

Through the 1980's, employment in air transportation occupations as a whole is expected to grow as the number of passengers increases. In addition to job openings created by growth, many new employees will be hired to replace those who retire, die, or stop working for other reasons.

The individual statements that follow describe the occupations most closely associated with flying: Airplane pilots, flight attendants, airplane mechanics, air traffic controllers, and reservation, ticket, and passenger agents.

Air Traffic Controllers

(D.O.T. 193.162-018)

Nature of the Work

Air traffic controllers are the guardians of the airways. Controllers keep track of planes flying within their assigned area, giving pilots instructions that will keep the planes separated. Their immediate concern is safety, but

controllers also must direct planes efficiently to minimize delays. Some regulate airport traffic; other regulate flights between airports.

Although airport 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, maintaining a safe distance between all aircraft while guiding pilots between the hangar 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 instructs the plane 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."

Controllers constantly watch the planes under their direction as they guide them to and from the airport. If a controller notices that two planes are on a collision course, one or both pilots will be instructed to turn or change altitude. Controllers also provide pilots with information about conditions at the airport, such as the weather, speed and direction of the wind, and visibility.

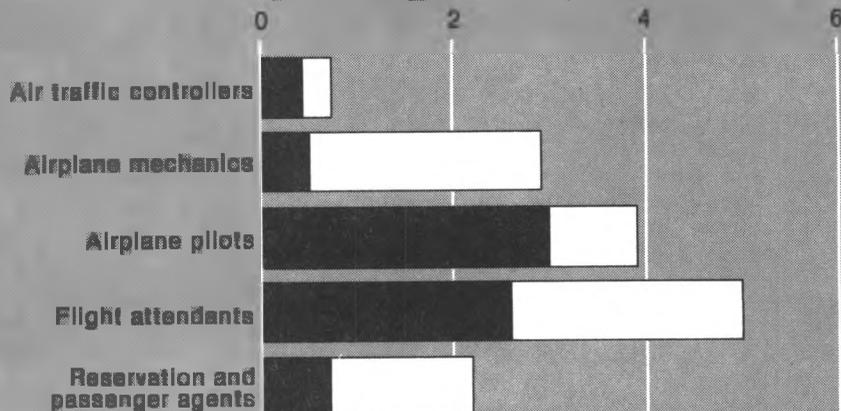
After each plane departs, airport traffic controllers notify enroute controllers who will next take charge. There are 25 enroute control centers located around the country. Airplanes generally fly along designated routes and each center is assigned a certain amount of airspace containing many of these 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 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. If two planes are on a collision course, they will be directed around each other. Or 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 during the altitude change. As the flight progresses, the team responsible for the aircraft notifies the next team in charge. Through this coordi-

Keen competition is expected for the relatively small number of openings in air transportation occupations

Average annual openings by selected occupation, 1978-80 (thousands)



Source: Bureau of Labor Statistics

■ Growth □ Deaths and retirements

nation, one team after another watches over the plane until it arrives safely at its destination.

Both airport and enroute controllers usually have several planes under their control at one time and often have to make quick decisions about completely different activities. For example, an arrival controller at an airport might direct a plane on its landing approach and at the same time provide pilots just 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 determine that they remain well separated.

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 must be operated 24 hours a day, 7 days a week, controllers rotate night and weekend shifts.

Air traffic controllers sometimes work under great stress. They must keep track of several planes at the same time and make certain all pilots receive correct instructions.

Places of Employment

About 21,000 persons worked as air traffic controllers in 1978, mostly at major airports and air route traffic control centers located near large cities. Almost all were employed by the Federal Aviation Administration (FAA).

Training, Other Qualifications, and Advancement

Air traffic controller trainees are selected through the competitive Federal Civil Serv-

ice System. Applicants must be less than 31 years old and must pass a written test that measures their ability to learn and perform 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 be in excellent health and have vision correctable to 20/20.

Potential controllers should be articulate, since directions to pilots must be given quickly and clearly. A quick and retentive memory also is important because controllers constantly receive information about the planes under their direction which they must immediately grasp, interpret, and remember for a short period. A decisive personality is an asset, since controllers often have to make rapid 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 a center, new controllers are first assigned to delivering teletyped flight plans to teams, gradually advancing to the position of manual handoff controller, then radar handoff controller and then radar controller. Failure to become proficient in any position at a facil-

ity within a specified time may result in dismissal. A substantial minority of controllers fail to complete either the academy or the on-the-job portion of the training program. Each year, controllers must pass a physical examination. They must pass a job performance examination twice each year.

Controllers can transfer to jobs at different locations and advance to supervisory positions. Some advance to management or staff jobs in air traffic control and a few to top administrative jobs in the FAA.

Employment 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, many 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 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.

Earnings

In 1978, controller trainees earned \$12,500 a year; the average for all controllers was \$25,400 a year, or over twice that for all non-supervisory workers in private industry, except farming. 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.

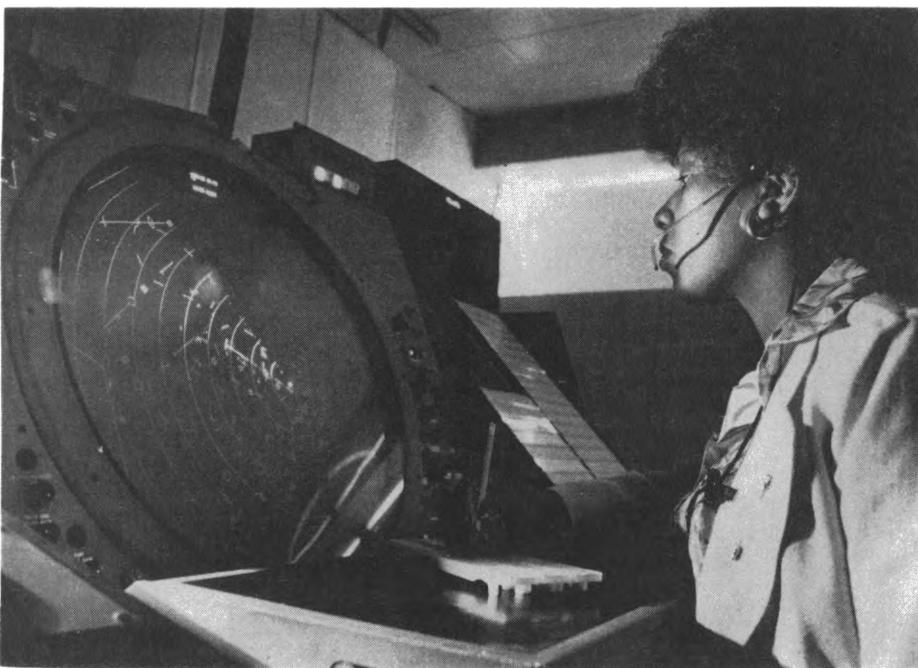
Many controllers belong to the Professional Air Traffic Controllers Organization.

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

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,



Controllers constantly monitor their radar screens to make sure planes remain well separated.

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.

Airplane Mechanics

(D.O.T. 621.281-014)

Nature of the Work

Today most travelers hardly think twice about flying thousands of feet above the ground. The confidence travelers have in airplanes is a tribute to the mechanics who maintain them. To keep planes in top operating condition, airplane 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 plane and perform 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 plane. Mechanics may take the engine apart to measure the parts for wear using sensitive instruments and check for invisible cracks with X-ray and magnetic inspection equipment. 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.

Some mechanics specialize in repair work, using 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 plane'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 plane can be put back into service quickly.

Mechanics may work on many types of airplanes, on one type of plane, or they may specialize in working on one section of the plane, such as engines or electrical systems. For efficiency's sake, airline mechanics usually specialize in one section of a particular type of plane. Mechanics employed by companies that own their own aircraft need only be familiar with the types of planes owned by the company. However, they must be able to repair all sections of these planes. At small, independent repair shops, mechanics usually

make all kinds of inspections and repairs on 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. This occurs most often to airline mechanics who work at airports because, to save time, minor repairs and preflight checks often are performed at the terminal. Mechanics sometimes must stand or lie in awkward positions when making repairs and work areas are noisy when engines are being tested. Some mechanics employed by the airlines must work nights.

Places of Employment

About 107,000 airplane mechanics were employed in 1978, not including about 25,000 who worked in aircraft manufacturing firms assembling airplanes. About one-half worked for airlines and about one-fourth worked for the Federal Government. The rest were general aviation mechanics, most 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 large military bases. 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

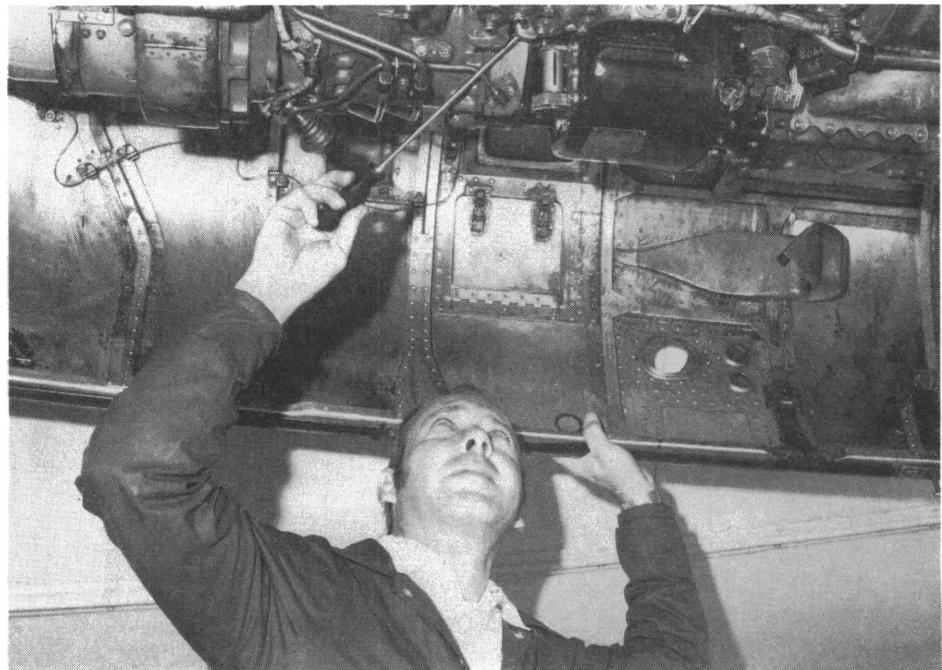
The majority of mechanics who work on civilian aircraft are licensed by the FAA as

"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, while 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.

At least 18 months of work experience are required for an FAA 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 give practical demonstrations of their ability to 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 mechanics will use on the job. Attendance at such schools may be used as a substitute for work experience when applying for an FAA license. However, these schools do not guarantee students jobs or FAA licenses.

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, their jobs in the military were too specialized to provide the broad experience



Airplane mechanic examining aircraft engine part for wear.

required by the FAA. Most find it necessary 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 in order to learn how to make repairs.

Aircraft mechanics must be able to do detailed work and have the strength to lift heavy parts and tools. Agility is important for the reaching and climbing that are necessary to the job. Aircraft mechanics must not be afraid of heights since they must work on the top of wings and fuselages on large jet planes.

As aircraft mechanics gain experience, they can 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. The avenue of advancement usually is mechanic to head mechanic (or crew chief), to inspector, to head inspector, 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.

Employment 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, many job 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. 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 jobs than in the airlines. Also, some additional 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. However, the introduction of large planes which require no more maintenance than the smaller ones now in use will limit mechanic employment.

Little change in the number of mechanics employed by the Federal Government is expected.

Opportunities will fluctuate with changes in defense spending.

Earnings

In 1978, annual earnings of airline mechanics averaged \$26,600, about 2 1/2 times the average for all nonsupervisory workers in private industry, except farming. As an additional benefit, airline mechanics and their immediate families receive reduced fare transportation with their own and most other airlines.

According to a survey by an aircraft maintenance association, beginning mechanics working at independent repair shops averaged \$5.00 an hour in 1978. Their wages increased to \$6.25 an hour after 1 year and to \$7.00 an hour after 3 years. This was about 1 1/3 times the average for all nonsupervisory workers in private industry, except farming.

Mechanics employed by most major airlines are covered by union agreements. 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.

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 airplane mechanics, write to:

Aviation Maintenance Foundation, P.O. Box 739, Basin, Wyo. 82410.

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.

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. Although most pilots transport passengers and cargo, many others perform tasks such as crop dusting, inspecting powerlines, 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 will give a fast, safe, and smooth flight. When flying under instrument flight rules, it is the responsibility of the pilot in command to assure that an instrument flight plan is filed 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. For large airplanes, the pilots already have calculated the speed they must attain to become airborne, taking into account the altitude of the airport, the outside temperature, the 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, tell them their exact position. Other very sophisticated instruments are used to determine

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 plane, the business pilot loads the plane and handles all passenger luggage. While the plane is being refueled, the business pilot stays with it to assure that the job is done properly. Other nonflying responsibilities include keeping records, scheduling flights and major maintenance, and performing minor maintenance and repair work on their planes. Some pilots are instructors and spend much of their time giving flying lessons. They teach their students the principles of flight in ground school classes and demonstrate how to operate the 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. 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. With the exception of 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.

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.

Places of Employment

About 76,000 civilian pilots worked full time in 1978. About one-half worked for the airlines. Many of the 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 flying passengers 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.

Most pilots work at the major airports located close to cities. In fact, over one-third of all pilots work near seven metropolitan areas—Los Angeles, San Francisco, New York, Dallas-Fort Worth, Chicago, Miami, and Atlanta.

Training, Other Qualifications, and Advancement

All pilots who are paid to transport passengers or cargo must have at least 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 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, but persons serving in the Armed Forces have the opportunity to gain the substantial experience on jet aircraft that is preferred by airlines and many businesses.

Pilots hired by airlines must be high school



Before takeoff, pilots make sure that all equipment is working properly.

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 give all applicants psychological tests and reject those who do not pass.

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 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.

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 may have the opportunity to 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.

Employment Outlook

Employment of pilots is expected to increase faster than the average for all occupations through the 1980's. In addition to the jobs created by employment growth, openings will result as experienced pilots die or retire. Competition for job openings should be keen, however, because the number of qualified pilots seeking jobs is expected to exceed the number of openings.

The expected growth in airline passenger and cargo traffic will create a need for more airliners and more pilots to fly them. But more than half the openings for pilots will occur outside the airlines. Businesses are expected to operate an increasing number of planes and employ more pilots to fly executives and cargo to locations that the scheduled airlines do not service. More flight instructors also will be needed to train new pilots.

Because wages are lower outside of the airlines, there is not as much competition for pilot 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 1978, the average salary for airline pilots was \$57,000 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.

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 a limited amount of reduced fare transportation on their own and other airlines.

According to a survey by a business aircraft association, earnings of business pilots ranged from \$12,000 for copilots on small planes to \$60,000 for some chief pilots of companies with large jets. Average salaries of business pilots were \$19,000 for those flying light piston planes, \$24,500 for light turboprop planes, \$29,000 for heavy turboprop planes, and \$34,000 for jet aircraft. Business pilots usually are eligible for the same benefits as other employees of their company.

According to a survey by an air transportation association, flight instructors working for air taxi companies averaged \$7 an hour. Pilots in these companies averaged \$8 an hour. Benefits in air taxi companies vary widely. Some of the large firms offer health and life insurance as well as pension plans to their employees. Some smaller companies offer none of these.

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 in the booklet *The People of the Airlines*. For a copy, write to:

Public Relations Department, 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, contact:

Aviation Education Program Division, Department of Transportation, Federal Aviation Administration, 800 Independence Ave. SW., Washington, D.C. 20591.

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.

Flight Attendants

(D.O.T. 352.367-010)

Nature of the Work

Flight attendants (also called stewardesses and stewards) are aboard almost all commercial passenger planes to help make the passengers' flight safe, comfortable, and enjoyable.

Before each flight, attendants 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 by hanging up coats and stowing small pieces of luggage under the seats.

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. Attendants also serve cocktails and other refreshments. On many flights, they heat and distribute precooked meals.

One of the most important functions of attendants is to assist passengers in the rare event of an emergency. These range from a disabled engine, where passengers must be reassured, to emergency landings, where attendants evacuate the plane, opening doors and inflating emergency slides. Attendants also must be prepared to administer first aid to passengers who become ill during the flight.



Flight attendants help make the passengers' flight safe, comfortable and enjoyable.

Working Conditions

Since airlines operate around the clock 365 days a year, attendants may work at night, on holidays, and on weekends. They usually fly no more than 80 hours a month, but they may devote up to 35 hours a month to the ground duties involved in preparing their planes for flights. 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 about one-third of the time or more. When they are away from home, 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. Poor weather can make it difficult to serve drinks and meals. Attendants stand during much of the flight and must remain pleasant and efficient regardless of how tired they may be.

Places of Employment

About 48,400 flight attendants worked for the airlines in 1978. Most attendants are stationed in major cities at the airlines' main bases; nearly three-fifths work near Chicago,

Dallas, Los Angeles, Miami, New York, and San Francisco. Airliners generally carry 1 to 10 flight attendants, depending on the number of seats on the plane and the proportion of economy to first-class passengers. Large aircraft like the Boeing 747 may have as many as 16 flight attendants.

Training, Other Qualifications, and Advancement

The airlines place great stress on the hiring of poised, tactful, and resourceful people. In particular, applicants should be able to talk comfortably with strangers. As a rule, applicants must be at least 19 years old. They must be in excellent health and have good vision. Vision may be corrected with contact lenses or, on most airlines, with glasses. Applicants also must 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 be able to speak an appropriate foreign language fluently.

Most large airlines give newly hired flight attendants about 5 weeks of training in their own schools. Transportation to the training centers and an allowance while in training may be provided. Trainees are taught how to react to emergencies, including instruction on evacuating an airplane, operating an oxy-

gen system, and giving first aid. Attendants also are taught flight regulations and duties, and company operations and policies. 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. The few airlines that do not operate schools generally send new employees to the school of another airline.

After completing their training, flight attendants are assigned to one of their airline's main bases. New attendants are placed on reserve and either fill in on extra flights or replace attendants who are sick or on vacation. They 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. When reserve attendants are on duty, they must leave word where they can be reached and be available for work at short notice. More senior attendants who no longer are on reserve bid for regular assignments. Because these assignments also are based on seniority, the most experienced attendants usually get their choice of base and flights.

Opportunities for advancement are limited. However, some attendants may advance to flight service instructor, customer service director, instructor, or recruiting representative.

Employment Outlook

Employment of flight attendants is expected to grow much faster than the average for all occupations through the 1980's. In addition to growth, openings will occur because of the need to replace experienced attendants who retire, die, or transfer to other occupations.

Increases in population and income are expected to increase the number of airline passengers. To deal with this growth, airlines usually enlarge their capacity by increasing the number and size of planes in operation. Since the Federal Aviation Administration safety rules require one attendant for every 50 seats, more flight attendants will be needed. Job opportunities may vary from year to year, however, because air travel is sensitive to ups and downs in the economy.

Because the job is attractive and offers a chance to travel, many people are interested in becoming flight attendants. Applicants can expect keen competition for the available jobs because the number of applicants is expected to exceed the number of openings. Applicants with 2 years of college and experience in dealing with the public have the best chance of being hired.

Earnings

Average monthly earnings of all flight attendants were \$1,200 in 1978. According to a number of union contracts, salaries of most beginning flight attendants on domestic flights ranged from \$700 to \$800 a month, while those on international flights earned from \$850 to \$950. As an additional benefit,

flight attendants and their immediate families are entitled to reduced fare transportation on their own and most other 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 (air transportation), ground host/hostess (air transportation), and social director.

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 company. Addresses of companies are available from:

Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

Reservation and Passenger Agents

(D.O.T. 238.367-010, -018, and -026)

Nature of the Work

In any company, the attitude with which employees deal with the public and the quality of the service they provide often make the difference between a satisfied or dissatisfied customer. In airline companies, this important personal contact is provided by reservation and passenger agents. These employees reserve seats, sell tickets, and help passengers board planes.

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 sits next 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.

airlines' downtown ticket offices. Like reservation agents, they book space on flights for customers. But passenger 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.

Passenger agents keep records of passengers on each plane and assist customers with problems such as lost or damaged baggage.

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 assist them in making connections.

At small airports agents also may load and unload baggage and freight on the ramp.

Working Conditions

Agents generally work 40 hours a week. Airlines operate flights at all hours of the day and night, however, and work schedules are irregular. Therefore, agents with little seniority may work nights and weekends.

During holidays and other busy periods, passenger agents especially may find the work hectic due to the large number of passengers who must be accommodated rapidly. And 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.

Places of Employment

About 56,000 reservation and passenger agents were employed in 1978. 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 passenger 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 systems. High school graduation generally is required, and some college training is preferred. Previous work experience dealing with the public is desirable.

New reservation agents receive about a month of classroom instruction. 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 drilled 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, while not alienating customers. Thus, an important part of their training consists of learning how to conduct these conversations in an organized yet pleasing manner.

After completing their classroom instruction, new agents receive on-the-job training from supervisors or experienced agents. Several weeks of experience are needed before an



Reservation and passenger agents use computers to obtain information on flight schedules and seat availability.

employee is able to handle the job without close supervision.

Learning the work of a passenger 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 the direction of an experienced agent. Usually, new passenger 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 passenger agents are promoted to supervisory positions and a small number eventually become city and district sales managers for airline ticket offices. Working as an agent can be a stepping stone to other entry level airline positions, however. Because of the occupation's large size, there are more openings for agents than for most other airline jobs. Thus, some individuals enter the airlines by working as agents and then transfer to other positions when openings develop.

Employment Outlook

Employment of reservation and passenger agents is expected to grow about as fast as the

average for all occupations through the 1980's. In addition to jobs that result from growth, many openings will arise as experienced workers retire, die, or transfer to other jobs. Opportunities for employment may fluctuate from year to year, however, since the number of airline passengers varies with ups and downs in the economy. Applicants will find considerable competition for openings because a large number of people are attracted to airline jobs.

More agents will be needed because of the anticipated increase in airline passengers. Although airlines are installing and upgrading computers to process reservations, keep records, and perform other routine tasks, computers cannot replace the personal contact that is an important part of a reservation or passenger agent's job.

Earnings

Passenger agents had estimated weekly earnings of \$371 in 1978, according to a survey of 21 airlines. Reservation agents averaged \$339. These earnings were about three-quarters more than the average for all non-supervisory workers in private industry, except farming. 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, International; 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 passenger 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.

Merchant Marine Occupations

The American merchant marine is a vital link in the Nation's transportation system. It transports America's products abroad and, in turn, brings imports from the rest of the world. In time of war, it carries troops, arms, and supplies to combat areas. Seafaring employment offers a variety of interesting and rewarding careers as well as travel and adventure.

About 38,300 officers and sailors worked aboard U.S. oceangoing vessels during 1978. The work aboard ships is divided among the deck, engine, and steward departments. The deck department is responsible for navigation, maintenance of the hull and deck equipment, and the supervision of loading, unloading, and storing of cargo. Personnel in the engine department operate and maintain the machinery that propels the vessel. The steward's department feeds the crew and maintains living and recreation areas.

To ensure that our country maintains its ability to transport essential cargo, the Government subsidizes the construction of some American ships and the wages paid to some crewmembers. The number of ships built, however, is expected to be only slightly more than the number of older ones taken out of service. Therefore, the size of the U.S. merchant fleet probably will remain fairly stable.

Little change in the employment of officers is expected through the 1980's. Employment of sailors, on the other hand, is expected to decline because new ships are equipped with laborsaving innovations such as automated engine rooms.

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 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.



Captain plotting vessel's course.

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 in assigning duties to the deck crew and maintaining 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 and out of port. On some ships, the chief mate also 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 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 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. 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 operation of the main powerplant and auxiliary equipment performance and fuel consumption.

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 makes sure proper steam pressure and oil and water temperatures are maintained and 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 a variety of 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. 193.282-022), who also maintains radio equipment. These officers send and receive messages by voice or Morse 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. They prepare payrolls and assist passengers as required. To improve the medical care aboard freighters and tankers and facilitate U.S. Public Health Service clearance when a ship arrives in port, some pursers have been trained as physician's assistants by the Staff Officers Association. On passenger ships these duties are performed by doctors and nurses.

Working Conditions

An officer working in the engine room must be able to withstand high temperatures while a deck officer must 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.

Places of Employment

About 13,500 officers were employed aboard U.S. oceangoing vessels during 1978. Deck officers and engineering officers accounted for more than four-fifths of the total, and radio officers made up most of the remainder. 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 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, no education requirements have been established for officers. 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, New York, N.Y. About 500 students graduate each year from these schools; about one-half are trained as deck officers and one-half as ma-

rine engineers. 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.

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.

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.

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 Calhoun Engineering School in Baltimore, Md., have restricted training programs to upgrading officers already licensed. The Calhoun School grants a third assistant engineer's license to about 90 graduates each year. The program consists of both classroom instruction and sea experience. Two of the three years are spent at the school in Baltimore and one is spent aboard various merchant ships. Students are provided with free room, board, medical care, and text books 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.

Some unions sponsor self-study programs for unlicensed sailors 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.

Employment Outlook

Little change in the employment of ships' officers is expected through the 1980's.

From the end of World War II up through the mid-1970's, the number of vessels in our merchant marine declined steadily as owners of American ships found it economically beneficial to register them outside the country. In recent years, however, the size of our fleet has stabilized and is expected to remain fairly constant 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 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 retire, die, or take shoreside employment. 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 exceed 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.

Should the Government mandate 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.

Earnings

Earnings of officers depend upon their rank and the type of ship. Wages are highest on large ships. The accompanying tabulation shows monthly base wages for officers aboard an average freighter in 1978. 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 \$1,438 may regularly earn about \$2,157 each month.

Officers and their dependents enjoy substantial pension and welfare benefits. Vacations range from 16 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 37 1/2 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 90 percent of 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 Brotherhood of Marine Officers represents deck and engine officers on some ships. 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 Manpower, Maritime Administration, U.S. Department of Commerce, Washington, D.C. 20230.

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.

Merchant Marine Sailors

Nature of the Work

Oil from Saudi Arabia, aluminum ore from Surinam, and cars from Japan, as well as countless other imported commodities, provide much of the energy and raw materials that our economy requires and the finished products that individuals enjoy. Yet these cargoes are so routinely transported across thousands of miles of ocean that our dependence on merchant ships—and sailors—for their delivery is frequently taken for granted.

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.

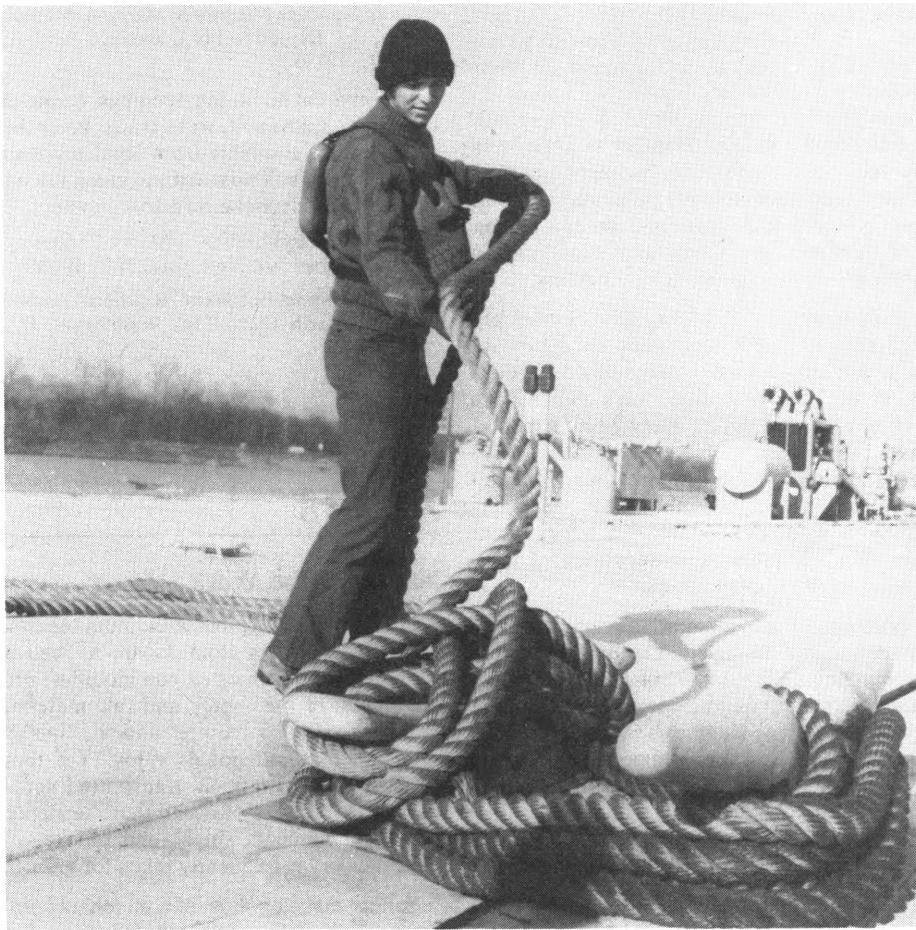
Able seamen (D.O.T. 911.364-010) make up about one-fifth of all sailors. They must have a thorough knowledge of all parts of the ship and be able to handle all gear and deck equipment. At times, they may act as quartermasters and steer the ship and may serve as lookouts.

Table 1. Monthly base wages for merchant marine officers, June 1978

| Occupation | Base pay ¹ |
|-------------------------------------|-----------------------|
| Captain | \$4,159 |
| Chief engineer | 3,779 |
| First assistant engineer | 2,259 |
| First mate | 2,259 |
| Radio officer | 1,920 |
| Second assistant engineer | 1,602 |
| Second mate | 1,601 |
| Third assistant engineer | 1,438 |
| Third mate | 1,438 |
| Purser | 1,217 |

¹East Coast wages aboard a single-screw ship of 12,000-17,000 power-tons.

SOURCE: U.S. Department of Commerce, Maritime Administration.



Sailors make up most of a merchant ship's crew and do most of the manual labor.

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 crewmembers 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 one to three *deck utility hands* (D.O.T. 911.687-022), who maintain the ship's decks under the supervision of the boatswain. They also determine the condition of bilges (compartments in the bottom of the hull) and do general maintenance work.

Some vessels carry a *ship's carpenter*

(D.O.T. 860.281-014) who secures cargo hatches and ports, and braces (shores) cargo. The carpenter also may operate winches that hoist and drop the anchor and do other general repair work on the ship's wooden parts.

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. 699.887-014) keep the engine room and machinery clean. Most cargo vessels carry two or 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, 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 engine room must be able to withstand high temperatures while a deck worker must adapt to both bitter cold and the hot sun. Able seamen may have to stand for considerable periods at a time while serving as a lookout.

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. Crewmembers 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.

Places of Employment

About 24,800 sailors were employed aboard U.S. oceangoing vessels during 1978. Due to long vacations and other breaks in duty, such as illness, the number of employed sailors is about one and a half times the number of jobs on ships. Nearly three-fifths 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 excellent

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 Command, 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. To get a job, a person must be present at the hiring hall when the opening becomes available.

For commercial vessels, the National Maritime Union and the Seafarers' International Union operate hiring halls along the Atlantic 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 hiring hall. When shipping companies send job orders to the hiring hall, sailors who have been unemployed the longest get first preference on any jobs for which they are qualified. Inexperienced applicants are expected to have difficulty getting jobs because the number of experienced workers exceed job openings. Applicants must be present at the hall 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 his 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. For full endorsement, applicants must be at least 19 years of age and pass an examination to test 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. However, the Seafarers' International Union of North America trains young people who have no sea experience for entry-rating jobs aboard U.S. flag ships at the Harry Lundeberg School for Seamanship at Piney Point, Md. Students entering the school are provided with room and board and a small weekly allowance while participating in training courses. Every graduate is guaranteed a job aboard ship.

Upgrading courses for sailors are offered

by the Seafarers' Union, the National Maritime Union of America, and a number of other organizations.

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 operates a program which trains individuals for jobs in the steward's department.

A small number of persons who show exceptional ability are selected for self-study, union-sponsored programs, which enable unlicensed sailors to advance to the licensed ranks as either third mate or third assistant engineer.

Employment 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 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 declined until recently as some owners transferred their ship's registration outside the country.

Little change in the number of ships is ex-

pected 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 cargo. To maintain this capability, the Government pays the difference in wages to a company if they use American crews, and helps pay for the construction or purchase of new ships.

The number of ships is expected to remain about the same because the number of new ships entering service should about equal those being retired. However, employment of sailors is expected to decline because new ships are operated with smaller crews. For example, vessels generally carry a crew of twelve sailors in the engineering department, whereas new ships only carry four: Three deck engine mechanics and one wiper. Deck engine mechanics replace oilers, firer-water-tenders, and electricians. Older freighters and tankers customarily employ three ordinary seamen, whereas their job has been eliminated on some newer ships. In addition, mechanization of tasks has eliminated jobs for some carpenters and the use of prepackaged food and smaller crew sizes have reduced the number of cooks and stewards.

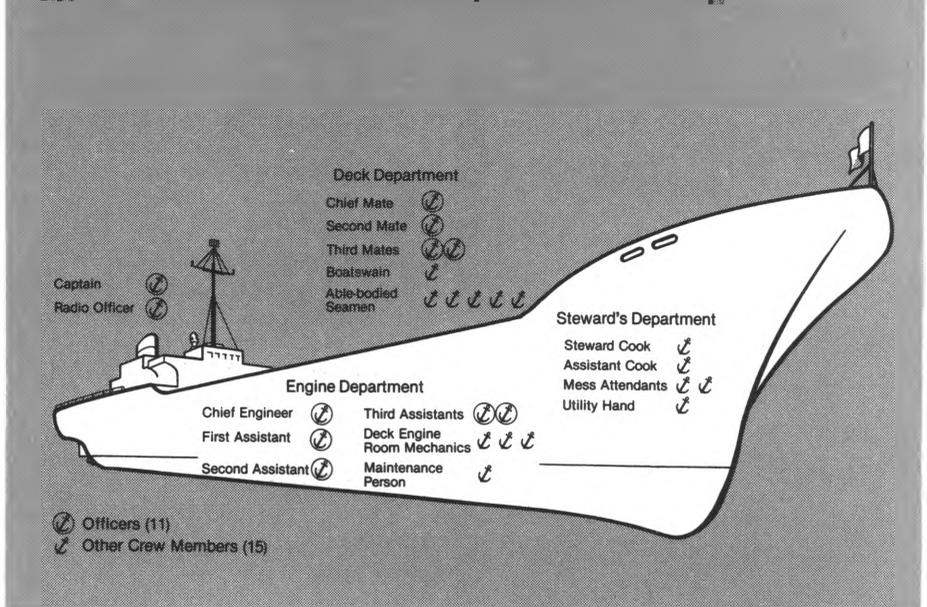
Employment opportunities may improve if the Government mandates that a fixed proportion of imported oil or exported grains be carried in American ships—a move that would require more American ships.

Earnings

Crewmembers 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 1978 is shown in the tabulation on the following page.

Monthly wages are supplemented by premium pay for overtime and other factors.

Typical crew aboard a modern, automated ship



On the average, premium earnings are equal to about 50 percent of base wages. For example, an oiler with a monthly base pay of \$865 regularly earns about \$1,298 each month.

Liberal employer-financed fringe benefits are provided. Vacations range from 10 to 14 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 crewmembers.

Sailors are represented by a number of

labor organizations; the two largest are the National Maritime Union of 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, ferryboats, deck hands, pilotboat deckhands and tugboat deckhands.

Sources of Additional Information

For general information about merchant marine sailors' jobs, write to:

Office of Maritime Manpower, Maritime Administration, U.S. Department of Commerce, Washington, D.C. 20235.

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 America, 36 Seventh Ave., New York, N.Y. 10011.

Seafarers' International Union of North America, 675 Fourth Ave., Brooklyn, N.Y. 11232.

Table 1. Monthly base wages for merchant marine sailors, June 1978

| Occupation | Base pay ¹ |
|---------------------------------------|-----------------------|
| Electrician | \$1,337 |
| Chief steward | 1,136 |
| Carpenter | 1,045 |
| Cook/Baker | 984 |
| Deck utility hand | 966 |
| Able seaman | 865 |
| Firewater-tender | 865 |
| Oiler | 864 |
| Ordinary seaman | 675 |
| Mess attendant/utility hand | 671 |

¹East Coast wages aboard a single-screw ship of 12,000-17,000 power-tons.

SOURCE: U.S. Department of Commerce, Maritime Administration.

Railroad Occupations

People, food, and industrial materials all move along the 190,000 miles of railroad lines that crisscross the Nation. In 1978, the railroads hauled 1.4 billion tons of freight and carried 281 million passengers, providing jobs for 550,000 people in the process. Railroad jobs are found in all States except Hawaii, and in communities of all sizes.

Large numbers of railroad workers are employed at terminal points where the railroads maintain control offices, freight yards, and maintenance and repair shops. Chicago, the hub of the Nation's railroad system, has more railroad workers than any other area, but many also are employed in or near New York, Los Angeles, Philadelphia, Minneapolis, Pittsburgh, and Detroit.

Railroad workers can be divided into four main groups: Operating employees; station and office workers; equipment maintenance workers; and property maintenance workers.

Operating employees make up almost one-third of all railroad workers. This group includes locomotive engineers, conductors, and brake operators. Whether on the road or at terminals and railroad yards, they work together as traincrews. Some other employees in this group are hostlers, who prepare locomotives for the traincrews, and switch-tenders, who throw track switches within railroad yards.

Another one-third of all railroad workers are *station and office employees*, who direct train movements and handle the railroads' business affairs. Professionals, such as managers, accountants, statisticians, and sys-

tems analysts, do administrative and planning work, while clerks handle business transactions, keep records, and prepare statistics. Agents manage the business affairs of the railroad stations. Telegraphers and telephoners pass on instructions to traincrews and help agents with clerical work.

More than one-fifth of all railroad employees are *equipment maintenance workers*, who service and repair locomotives and cars. This group includes car repairers, machinists, electrical workers, sheet-metal workers, boilermakers, and blacksmiths.

Property maintenance workers, who make up almost one-fifth of all railroad employees, build and repair tracks, tunnels, signal equipment, and other railroad property. Trackworkers repair tracks and roadbeds. Bridge and building workers construct and repair bridges, tunnels, and other structures along the right-of-way. Signal workers install and service the railroads' vast network of signals, including highway-crossing protection devices.

Discussions of the work, training, outlook, and earnings for some major occupations in railroads are presented in the statements that follow. Information on employment also is available in the statement on occupations in the railroad industry elsewhere in the *Handbook*. Details about specific jobs may be obtained from local railroad offices. General information on the industry is available from: Association of American Railroads, American Railroads Building, 1920 L St. NW., Washington, D.C. 20036.

Brake Operators

(D.O.T. 910.364-010, .367-010, and .664-010)

Nature of the Work

Brake operators play a pivotal role in making locomotives and cars into trains. Working with engineers and under the direction of conductors, they do the physical work involved in adding and removing cars at railroad stations and assembling and disassembling trains in railroad yards.

Most freight traincrews include two road brake operators—one in the locomotive with the engineer and another in the caboose with the conductor. A few small freight trains need only one in the locomotive. Before departure, brake operators inspect the train to make sure that all couplers and airhoses are fastened, that handbrakes on all the cars are released, and that the airbrakes are functioning correctly. While underway they regularly look for smoke, sparks, and other signs of sticking brakes, overheated axle bearings, and other faulty equipment. They may make minor repairs to airhoses and couplers. In case of unexpected stops, brake operators set out signals to protect both ends of the train.

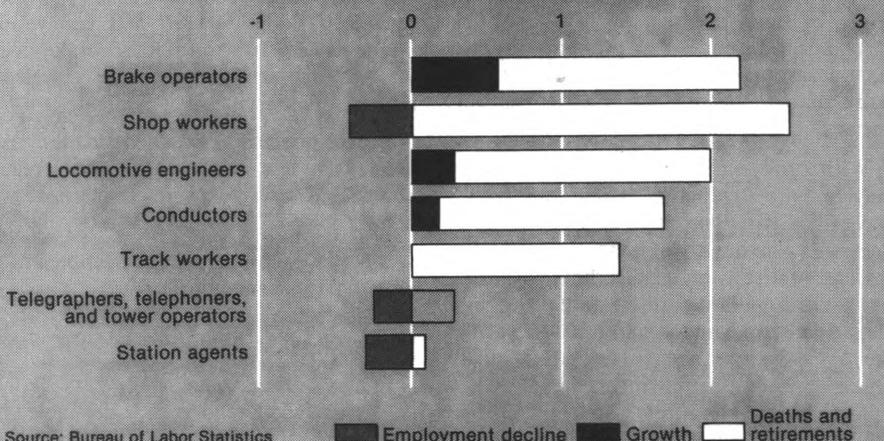
When freight trains approach an industrial site, the brake operator in the locomotive jumps off the moving train and runs ahead to switch the train to the proper track. The brake operators uncouple cars that are to be delivered and couple those that are to be picked up.

The number of brake operators aboard passenger trains varies. Some trains have a brake operator in each car to help the conductor collect tickets and assist passengers. Other trains have just one brake operator stationed in the rear car, and other train employees collect tickets. Brake operators also regulate car lighting and temperature on passenger trains.

Yard brake operators (also known as yard couplers or helpers) help assemble and disassemble trains in railroad yards, according to instructions from yard conductors. They use hand signals or two-way radios to signal engineers where to move cars. Railroad cars generally are not pushed very far by the engine, but instead are allowed to roll to their destination in the yard. Brake operators uncouple the cars and throw track switches to route them to certain tracks if they are to be unloaded, or to an outgoing train if their final destination is further down the line. They may ride a car, operating the handbrake to regulate its speed.

Although railroad employment is expected to decline overall, most occupations will offer some openings because of replacement needs

Average annual openings in selected occupations, 1978-90 (thousands)



Source: Bureau of Labor Statistics



Brake operators couple and uncouple cars at stations and industrial sites.

Working Conditions

The work of yard brake operators and freight brake operators on local runs (where trains frequently stop at stations to pick up and deliver cars) is physically active. Climbing up and down cars, setting and releasing handbrakes, riding cars, and throwing switches is strenuous work. In addition, brake operators do this work outdoors in all kinds of weather.

Most freight trains are unscheduled, so few road brake operators have scheduled assignments. Instead, their names are placed on a list and when their turn comes they are assigned the next train, usually on short notice and often at odd hours. Since freight and passenger brake operators often work on trains that operate between terminals that are hundreds of miles apart, they may spend several nights a week away from home.

Since trains operate 24 hours a day, 7 days a week, brake operators often work nights, weekends, and holidays. Undesirable shifts are assigned to those with the least seniority.

Training, Other Qualifications, and Advancement

On most railroads, beginning brake operators make several trips with conductors and experienced operators to become familiar with the job. Their names are then put on the

“extra board” and they are given assignments to substitute for workers who are absent for vacations, illness, or other reasons. On some railroads, however, new brake operators first are given several days of training, including instruction on signaling, coupling and uncoupling cars, throwing switches, and boarding moving equipment. Following this training period, these brake operators accompany experienced crews for several trips before being placed on the extra board. It usually takes several years before brake operators acquire enough seniority to get regular assignments.

Employers prefer applicants who are high school graduates or the equivalent. Good eyesight and hearing are essential. Mechanical aptitude is helpful and physical stamina is necessary. Most employers require that applicants pass physical examinations.

With sufficient seniority, brake operators may become conductors. These jobs are always filled by promoting experienced brake operators who have qualified by passing written and oral tests on signals, brake systems, timetables, operating rules, and other subjects. Some companies require that these tests be passed within the first few years of the brake operator's employment. Since promotions on almost all railroads are controlled by seniority rules, brake operators usually wait at least 10 years before becoming conductors.

Advancement to conductor jobs is limited since there are many more brake operators than conductors. A few brake operators in freight service move to passenger service, usually considered more desirable because it is less strenuous.

Employment Outlook

Employment of brake operators—who numbered nearly 66,000 in 1978—is not expected to change through the 1980's. Openings will develop, however, as experienced brake operators retire, die, advance to jobs as conductors, or transfer to other work.

Even though total employment of brake operators is not expected to change, the number of those in road service will increase since more trains will be needed to haul the additional freight volume created by growth in population and industry. Employment gains will be moderated, however, by innovations that make it possible to move freight more efficiently. For example, trains will be able to carry more freight as the railroads continue to replace older freight cars with larger, better designed ones. Also, changes in the size of train crews, eliminating one brake operator where there now are two, will limit employment growth.

The number of yard brake operators is expected to decrease, primarily due to the installation of automatic classification systems in more yards. In an automatic classification yard, cars are braked and routed by electronic controls. Fewer brake operators are needed in these yards, mainly to connect air-hoses, uncouple cars, and retrieve misrouted ones. Yard employment also will be limited by the use of new freight cars, which take as much time to route as older ones but carry more freight.

Earnings

In 1978, brake operators had average monthly earnings of \$1,345 in yard service, \$1,710 in freight service, and \$1,784 in passenger service. These earnings were about twice as much as the average for all non-supervisory workers in private industry, except farming.

Yard brake operators usually work a scheduled 40-hour week and receive premium pay for overtime. Road brake operators are paid according to miles traveled or hours worked, whichever is greater.

Brake operators assigned to the extra board have less steady work, more irregular hours, and lower earnings than those with regular jobs.

Most brake operators are members of the United Transportation Union.

Related Occupations

Other workers who shunt cars between tracks are switch tenders, transfer-table operator helpers, brake holders, and car droppers (mining and quarrying).

Conductors

(D.O.T. 198)

Nature of the Work

Conductors are in charge of train and yard crews. They are responsible for the safe and punctual delivery of cargo and passengers and the accurate assembly of trains.

Road conductors assigned to freight trains keep records of each car's contents and destination and make sure that cars are added and removed at the proper points along the route. Conductors assigned to passenger trains collect tickets and fares and answer passengers' questions about schedules and operating rules. At stops they signal engineers when to pull out of the station.

Before a train leaves the terminal, the conductor receives instructions on the train's route, timetable, and cargo from the dispatcher and discusses these with the engineer. On many trains, conductors can receive additional information by radio while underway. This may include information about track conditions ahead, or instructions to pull off at the next siding to let another train pass. During the run, conductors use two-way radios to contact engineers. They pass on instructions received from dispatchers and remind engineers of stops, reported track conditions, and the presence of other trains.

Conductors regularly receive information from brake operators on the condition of the cars. If a problem occurs, conductors arrange either for repairs while underway or for removal of the defective car at the nearest station or siding. They inform dispatchers of any problems using radio or wayside telephones.

Yard conductors supervise the crews that assemble and disassemble trains. They receive instructions from yardmasters on where to move the cars of newly arrived trains. Some cars will be sent to special tracks for unloading, while the rest will be moved to other tracks to await being made into trains going to different cities. Conductors tell engineers where to move cars and tell brake operators which cars to couple and uncouple and which switches to throw to divert the locomotive or cars to the proper track. In yards that have automatic classification systems, conductors may use electrical controls to operate the track switches that route cars to the correct track.

Working Conditions

Most freight trains are unscheduled, so few road conductors have scheduled assignments. Instead, their names are placed on a list and when their turn comes they are assigned the next train, usually on short notice and often at odd hours. Because road service conductors often work on trains that operate between stations that are hundreds of miles apart, they may spend several nights a week away from home.



Seniority is the main factor in determining promotion from brake operator to conductor.

Since trains operate 24 hours a day, 7 days a week, conductors often work nights, week-ends, and holidays. Undesirable shifts are assigned to conductors who have the least seniority.

Freight conductors spend much of their time and yard conductors all of it outdoors in all kinds of weather.

Training, Other Qualifications, and Advancement

Jobs as conductors always are filled from the ranks of experienced brake operators who have passed tests covering signals, timetables, operating rules, and related subjects. Until permanent positions become available, new conductors are put on the "extra board," where they substitute for experienced conductors who are absent because of illness, vacations, or other reasons. On most railroads, conductors on the extra board may work as brake operators if there are not enough conductor runs available for them that month. Seniority almost always is the main factor in determining promotion from brake operator to conductor and from the extra board to a permanent position.

Most railroads maintain separate seniority lists for road service and yard service conductors; conductors usually remain in one type of service for their entire career. On some roads, however, conductors start in the yards, then move to freight service, and finally to passenger service. Some conductors advance to managerial positions such as trainmaster or yardmaster.

Employment Outlook

Employment of conductors—who numbered about 36,600 in 1978—is expected to grow more slowly than the average for all occupations through the 1980's. Most job

openings will result from the need to replace conductors who are promoted, or who retire or die.

The transportation requirements of the country will increase as growth in population and industry creates a demand for more consumer and industrial products. This will result in an increase in employment of road service conductors, since more trains will be needed to haul the additional freight volume. However, employment growth will be moderated by innovations that make it possible to move freight more efficiently. For example, trains will be able to carry more freight as the railroads continue to replace older freight cars with larger, better designed ones.

Employment of yard conductors, on the other hand, is not expected to change. Continued modernization of yards, especially the addition of automatic classification systems, will improve yard efficiency. Yard employment also will be limited by the new freight cars, which take the same time to route as older ones but carry more freight.

Earnings

In 1978, conductors had average monthly earnings of \$1,637 in yard service, \$1,723 in passenger road service, and \$2,064 in freight road service. These earnings were more than double the average for all nonsupervisory workers in private industry, except farming.

Yard conductors usually work a scheduled 40-hour week and receive premium pay for overtime. Road conductors are paid according to miles traveled or hours worked, whichever is greater. Conductors on the extra board frequently work less than 40 hours a week as conductors and, therefore, earn less than those who have regular jobs.

Many conductors are members of the United Transportation Union.

Related Occupations

Other first line supervisors in the railroad industry are freight loading supervisors, station agents, car chasers, car distributors, baggage and mail agents, car-cleaning supervisors, and freight-loading supervisors.

Locomotive Engineers

(D.O.T. 910.363-014, -018)

Nature of the Work

Engineers are among the most skilled employees on the railroad. They must have a thorough knowledge of the signal systems, yards, and terminals along their route and be constantly aware of the condition and makeup of the train. Trains react differently to acceleration, braking, and curves, depending on the number of cars, the ratio of empty to loaded cars, or the amount of slack in the train. Misjudgment by the engineer of these or many other factors can lead to whiplash injuries to passengers and crew members, damaged cargo, broken couplers, or even derailment.

Engineers operate locomotives in passenger, freight, and yard services. Road service engineers transport cargo and passengers between stations, while yard engineers move cars within yards to assemble or disassemble trains. Most engineers run diesel locomotives; a few run electrics.

Engineers operate the throttle to start and accelerate the train and use airbrakes to slow and stop it. They also watch gauges and meters that measure speed, fuel, temperature, battery charge, and air pressure in the brake lines. Both on the road and in the yard, they watch for signals that indicate track obstructions, other train movements, and speed limits.

Before and after each run, engineers check locomotives for mechanical problems. Minor adjustments are made on the spot, but major defects are reported to the engine shop supervisor.

Working Conditions

Most freight trains are unscheduled, so few road engineers have scheduled assignments. Instead, their names are placed on a list and when their turn comes they are assigned the next train, usually on short notice and often at odd hours. Because those in road service may deliver cargo or passengers to a distant station one day and not return until the next, they may spend several days a week away from home.

Most labor agreements place a maximum on the number of miles a road service engineer can cover per month. Those who reach the limit are replaced by "extra board" engineers for the rest of the month.



Yard engineer receives instructions on car movement.

Since trains operate 24 hours a day, 7 days a week, engineers may have to work nights, weekends, and holidays. Desirable shifts are assigned to engineers who have the most seniority.

Training, Other Qualifications, and Advancement

Openings in engineer jobs on the majority of railroads are filled by training and promoting engineer helpers according to seniority rules. Some railroads, though, train applicants directly as engineers. A few promote brake operators.

Helpers ride in locomotives with engineers and assist them by inspecting locomotives, watching for signals and track obstructions, and monitoring gauges. New helpers receive on-the-job training lasting up to 6 weeks, during which time they learn their duties and railroad rules and regulations. They are then assigned as engineer helpers on regular jobs.

Railroads prefer that applicants for helper and engineer positions have a high school education and be at least 21 years old. Applicants must have good hearing, eyesight, and color vision. Good eye-hand coordination, manual dexterity, and mechanical aptitude also are required.

Helpers generally are placed in training programs for engineer jobs within 1 year following their initial hiring date. These programs, and those for engineer trainees and brake operators, include classroom and on-the-job training in locomotive operation. A few programs include extensive training on simulators. At the end of the training period, the potential engineers take qualifying tests covering locomotive equipment, airbrake systems, fuel economy, train handling techniques, and operating rules and regulations.

As engineers are needed, newly trained engineers or qualified helpers who have the most seniority are placed on the engineers' extra board. Extra board engineers substitute for regular engineers who are absent because of vacation, illness, or other reasons. Extra board engineers frequently have to wait a number of years before accumulating enough seniority to get a regular assignment. Seniority rules also may determine the engineers' type of service. For instance, from a first regular assignment in yard service, they may move to road service.

Engineers must pass periodic physical examinations which determine their fitness to operate locomotives. They must have keen eyesight and hearing. In some cases, engineers who fail to meet the physical standards are just restricted to yard service or demoted to helper, but in other instances they are discharged.

Employment Outlook

Employment of locomotive engineers—who numbered about 34,200 in 1978—is expected to increase more slowly than the average for all occupations through the 1980's. Most job openings will arise from the need to replace engineers who retire or die.

The need for transportation services will increase as growth in population and industry creates a demand for more consumer and industrial products. This will result in an increase in employment of road service engineers, since more trains will be needed to haul the additional freight volume. However, this employment growth will be moderated by innovations that make it possible to move freight more efficiently. For example, trains will be able to carry more freight as the railroads continue to replace older freight cars with larger, better designed ones.

Employment of yard engineers, on the other hand, is not expected to change. Continued modernization of yards, especially the addition of automatic classification systems that electronically route cars to the proper track, will improve yard efficiency. Yard employment also will be affected by the new freight cars, which take as much time to route as older ones but carry more freight.

Earnings

The earnings of engineers depend on the size of the locomotive and type of service. In 1978, monthly earnings of engineers averaged \$1,815 in yard service, \$2,188 in passenger service, and \$2,290 in freight service. Engineers earned two to three times as much as the average for all non-supervisory workers in private industry, except farming.

Yard engineers work 40 hours a week, and receive premium pay for overtime. Road service engineers are paid according to miles traveled or hours worked, whichever leads to higher earnings. Engineers assigned to the extra board have less steady work, more irregular hours, and lower earnings than those who have regular jobs.

Most engineers are members of the Brotherhood of Locomotive Engineers; some are members of the United Transportation Union.

Related Occupations

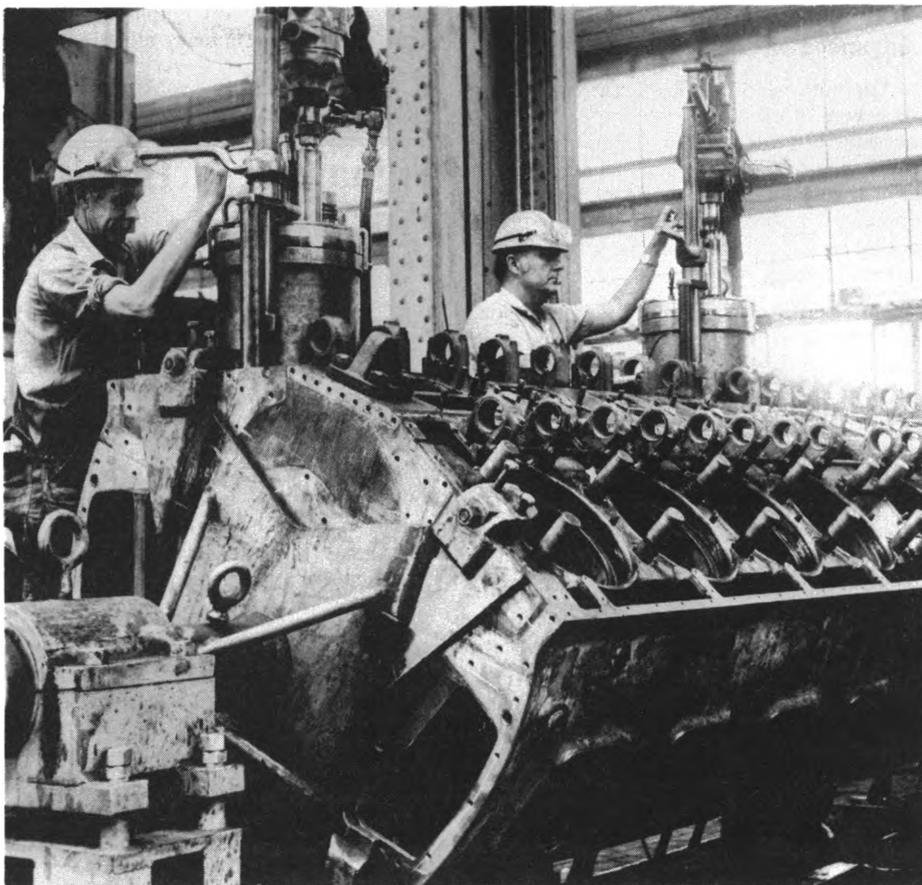
Operators of other vehicles on tracks are scale car operators (iron and steel), rail-tractor operators (iron and steel), larry-car operators, and subway operators. Other workers who move freight and passengers are local truckdrivers, long-distance truckdrivers, local transit busdrivers, and intercity busdrivers.

Shop Trades

Nature of the Work

Every railroad employs its own workers to maintain, repair, and rebuild railroad cars, locomotives, and other equipment. In 1978, there were over 75,600 workers in the six principal shop trades—about 38,700 car repairers, 17,300 machinists, 11,600 electrical workers, 4,800 sheet-metal workers, 1,600 boilermakers, and 980 blacksmiths. These skilled craft workers are employed in railroad yards, terminals, and engine houses, as well as in major car and locomotive repair facilities.

Car repairers (D.O.T. 622.381-014) keep freight and passenger cars, tank cars, and some sections of locomotives in good running condition. Some repairers specialize in visually examining cars and locomotives every time they enter yards. They inspect parts such as wheels, brake assemblies, and cou-



Shop workers overhaul a locomotive engine.

plers, looking for defects that might lead to accidents or delays. They may make minor repairs on the spot, but defective cars usually are fixed on special tracks by other car repairers. These repairs include straightening ladders on freight cars, fixing leaks in car roofs, changing wheels, and replacing couplers.

Some car repairers work in special yards rebuilding old or badly damaged cars. They also may convert standard cars received from manufacturers into custom-built ones for specialized purposes.

The other shop workers primarily service locomotives. Locomotives are overhauled on a regular basis and each craft plays a role in the inspection and repair of defective or damaged locomotives.

Although a few *machinists* (D.O.T. 600.-280-022) use metal cutting and forming tools to repair parts of locomotives, most do mechanical work on engines. During overhauls, machinists examine valves, transmissions, fuel lines, and other components for damage or wear. During major overhauls they may strip the engine completely. Exterior components, such as wheels and axles, also are inspected and any defective or worn parts are replaced.

During these overhauls, *electrical workers* (D.O.T. 825.281-026) repair or install new wiring and inspect the generator and electric motors in the engine. They also maintain air-conditioning systems and the cooling systems

in refrigeration cars. Some maintain the wiring in railroad buildings.

Machinists and electrical workers also examine engines that have mechanical or electrical problems. Much of this work is done in the shop, but if a locomotive breaks down up the track, a team consisting of a skilled machinist and an electrical worker is sent to the site to attempt to repair it on the spot.

Sheet-metal workers (D.O.T. 804.281-010) and *boilermakers* (D.O.T. 805.261-014) repair sheet-metal sections of locomotives and the pipes and tubes in locomotive engines. They also work on other equipment made of steel plates such as stationary boilers and tanks. *Blacksmiths* (D.O.T. 610.381-010) repair locomotive frames and other heavy metal parts. More information on machinists, electricians, boilermakers, and blacksmiths can be found elsewhere in the *Handbook*.

Working Conditions

Shopwork is active and strenuous, involving stooping, climbing, and lifting. In addition, much of the work of car repairers is done outdoors in all kinds of weather. Other workers face noisy shop conditions and are sometimes exposed to fumes from diesel engines.

To keep locomotives running, shops performing light maintenance must be open around the clock. Workers at these shops are assigned to night and weekend shifts on the basis of seniority.

Training, Other Qualifications, and Advancement

Apprenticeship training is the most common way of entering shop trades. Apprenticeships last 3 to 4 years, depending on the trade. Some individuals start as helpers, and after several years of experience advance to apprentice positions. Because of their previous shop experience, helpers serve shorter apprenticeships.

Most of the training takes place on the job, with the apprentice assisting and observing more experienced employees. A few railroads supplement this work experience with classroom instruction. Many others require that apprentices participate in correspondence courses, often on their own time.

Most railroads prefer that applicants for apprenticeships have a high school or vocational school diploma. Some shop training while in high school is desirable. Automobile repair and machining courses are useful for machinists. Courses in electricity and physics will help electrical workers. On some roads, applicants must pass mathematical and mechanical aptitude tests.

Some workers in shop trades advance to supervisory positions.

Employment Outlook

Employment of shop trades workers is expected to decline through the 1980's as shop efficiency continues to increase and as older railroad cars are replaced with new ones that are more durable and more easily maintained. However, job openings will develop for new apprentices or helpers as experienced workers retire, die, or transfer to other fields of work.

Earnings

In 1978, hourly earnings averaged \$7.75 for electrical workers, \$7.73 for boilermakers, \$7.67 for sheet-metal workers, \$7.66 for machinists, \$7.65 for car repairers, and \$7.62 for blacksmiths. Shopworkers have a 40-hour workweek and receive premium pay for overtime.

Most shopworkers are union members. Among the unions in this field are: Brotherhood of Railway Carmen of the United States and Canada; International Association of Machinists and Aerospace Workers; International Brotherhood of Electrical Workers; Sheet Metal Workers' International Association; International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers; Transport Workers Union of America; and the International Brotherhood of Firemen and Oilers. Several of these unions negotiate labor-management agreements through the Railway Employees' Department of the AFL-CIO.

Related Occupations

Individuals interested in working as machinists, electricians, sheet-metal workers, boilermakers, and blacksmiths need not limit

themselves to railroad employment, since these jobs also exist in many other industries.

Signal Department Workers

(D.O.T. 822.281-026 and .684-018)

Nature of the Work

Railroad signal workers install, repair, and maintain the train control, communication, and signaling systems that direct train movement and assure safety. These include gate crossings and signal lights, as well as systems that operate signals and throw switches by remote control. The work usually consists of either general maintenance of the signal systems or installation and major repair.

Signal installers work in crews, usually consisting of at least five workers. They install new equipment and make major repairs. They do mostly construction work that includes digging holes and ditches, hoisting poles, and mixing and pouring concrete to make foundations. They also assemble the control and communications devices, make the electrical connections, and sometimes perform the extensive testing that is required to assure that new signal systems work properly.

Individual *signal maintainers* are assigned a section of track and are responsible for keeping gate crossings, signals, and other control devices within their section in good operating condition. They periodically inspect these devices using electrical testing equipment to check signal relays and circuit connections. They lubricate mechanical parts and examine these, as well as wires and switches, for wear. Maintainers may rewire

units, regap switches, and repair or replace worn, damaged, or defective parts. They may have to climb poles to reach signals and sometimes work near high-voltage wires.

Signal installers and maintainers are composite mechanics. They not only need a thorough knowledge of electricity and electronics, but they also must be competent carpenters, painters, and welders, and feel comfortable working with cement, metal, and machinery.

Working Conditions

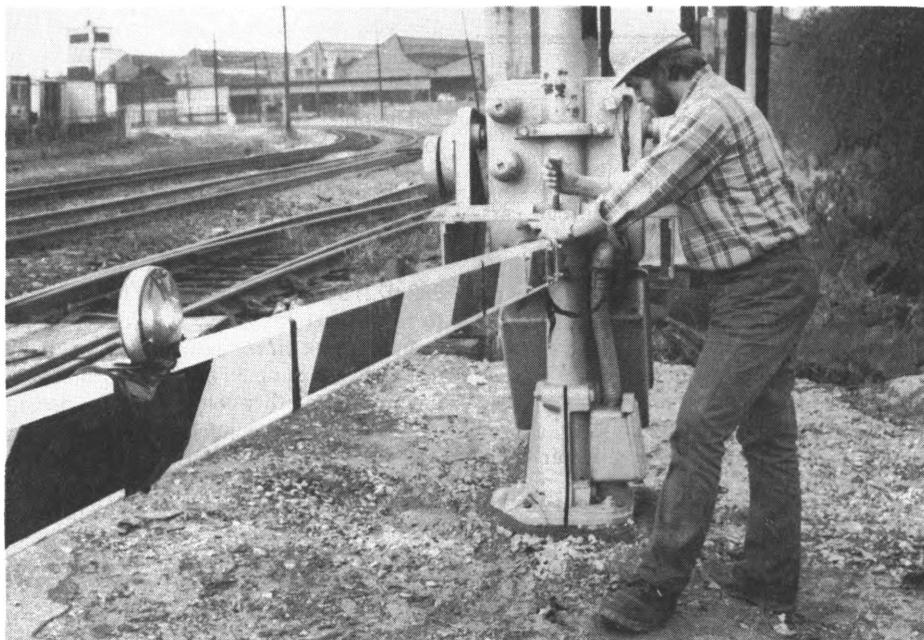
Since they work over large sections of track, installers usually live away from home during the workweek, sometimes in camp cars provided by the company. Maintainers usually live at home and service signals over a limited stretch of track. However, they must make repairs regardless of weather conditions or time of day.

Training, Other Qualifications, and Advancement

New employees usually are assigned as assistants to installation crews. Some railroads hire applicants as helpers, however, and after a 60- to 90-day probationary period promote them to assistant. After 2 years of work experience, which on most railroads is interspersed with short periods of classroom instruction, assistants are promoted to signal installer or maintainer.

Assistants usually advance to signal installer, since openings in the more desirable maintenance positions are filled by senior signal installers. These promotions and assignments are made on the basis of seniority, provided ability is sufficient.

When hiring helpers or assistants, railroads prefer applicants who are high school or vocational school graduates. Courses in blueprint reading, electricity, electronics,



Signal maintainer inspects grade crossing.

and shop provide a helpful background. Applicants also should be capable of doing heavy work.

Both signal installers and maintainers may be promoted to signal inspector or technician. Technicians assist installers with complicated systems while inspectors check the work of both installers and maintainers. Some installers and maintainers become gang supervisors and a few advance to higher supervisory positions.

Employment Outlook

Employment of signal department workers—who numbered about 12,800 in 1978—is expected to grow more slowly than the average for all occupations through the 1980's. Most job openings will result from the need to replace experienced workers who retire, die, or transfer to other fields.

Additional signal workers will be needed to maintain the existing stock of equipment as well as install and maintain the new signal and train control systems that are planned for the future. Employment growth will be limited, however, since many new signal systems have fewer moving parts and require less maintenance. Employment also will be affected as the railroads continue to close some sections of track that are unprofitable or are made unnecessary as the installation of improved train control systems enables railroads to use less track.

Earnings

In 1978, signal installers and maintainers averaged \$7.83 an hour, about two-fifths more than the average for all nonsupervisory workers in private industry, except farming. Assistants averaged \$6.72 an hour and helpers \$6.55 an hour. Most signal workers have a 40-hour week and receive premium pay for overtime.

Most signal installers and maintainers are members of the Brotherhood of Railroad Signalmen.

Related Occupations

Other occupations which involve installing and repairing electrical equipment include electricians, central office installers, central office repairers, telephone maintenance mechanics, PBX repairers, and protection-signal installers.

Station Agents

(D.O.T. 211.467-030 and 910.137-038)

Nature of the Work

Station agents are the customers' contact with the railroad. Most agents service small freight stations. They take orders from companies that have cargo to be shipped and arrange for railroad cars to transport their products. Agents prepare customer bills and

must be knowledgeable about the complex railroad billing procedure. When loaded cars are delivered to a station, the agent inspects the merchandise for damage and informs the recipient that the goods are ready for unloading. In some cases agents may pass on train orders and other messages to train crews. At larger stations, many of these tasks may be done by clerks, telephoners, and others who are under the agent's supervision.

At passenger stations, agents supervise and coordinate the activities of workers who sell tickets and check baggage. At major freight and passenger stations, the agent's duties are primarily administrative and supervisory.

Many agents, often called mobile agents, service several small stations that get little business. They travel from station to station, opening each only long enough to transact the business at hand.

Working Conditions

Agents servicing a single station generally work in offices. But mobile agents spend much of their time driving and may conduct business in their van, car, or outside along the track.

Training, Other Qualifications, and Advancement

Station agents rise from the ranks of other railroad occupations. With sufficient seniority and ability, telephoners, telegraphers, tower operators, and clerks may be promoted to agents in small stations and may advance to larger stations as they gain additional seniority. Agents may be promoted to managerial positions such as supervisory agent or auditor.

Employment Outlook

Employment of station agents—who numbered about 6,000 in 1978—is expected to decline through the 1980's as more customer orders and billing are handled at large, centrally located stations, and as an increasing number of smaller stations are serviced by mobile agents. A limited number of jobs will arise from the need to replace experienced agents who retire, die, or stop working for other reasons.

Earnings

In 1978, agents in small stations averaged \$7.72 an hour, while agents in major stations averaged \$9.45 an hour. A 40-hour workweek is standard, and time and one-half is paid for overtime.

Station agents are members of the Brotherhood of Railway, Airline and Steamship Clerks, Freight Handlers, Express and Station Employees.

Related Occupations

Other workers in the transportation industries who estimate bills or arrange for shipping are demurrage clerks, waybill clerks, incoming-freight clerks (water transportation),

documentation-billing clerks, and booking clerks (water transportation).

Telegraphers, Telephoners, and Tower Operators

(D.O.T. 236.562-010, -014 and 910.362-010)

Nature of the Work

On many sections of track, a train's movement is directed from a central location—switches are thrown by remote control and train crews are given instructions by radio. Where this centralized control has not been put into effect, however, trains are controlled by telegraphers, telephoners, and tower operators.

Tower operators work in towers located in railroad yards or at major junctions on the outskirts of cities. Following instructions given by dispatchers and yardmasters, they route train traffic by operating controls that activate signals and throw switches on the track below. By throwing switches, a tower operator in a yard can route trains to other yards within the city, onto industrial tracks to pick up or deliver cars, or to a main track leaving the city. Once a train is outside the city, another tower operator directs it to tracks leading to other cities. By controlling signals, tower operators also can pass on instructions to train crews. For example, if a yard is full, the yardmaster will instruct a tower operator to signal an approaching train to wait outside the city, rather than have it block streets while waiting its turn at the entrance to the yard.

Telegraphers and telephoners work in yards and stations. They receive orders on train movements, such as instructions to wait at a crossing for another train to pass, from dispatchers and pass this information on to train crews, either verbally or in written instructions. In addition, those at stations assist station agents in taking orders and billing customers. They also may telephone or teletype information to headquarters, such as the number of cars requested by a shipper.

Working Conditions

Trains operate 24 hours a day, 7 days a week. Since train crews depend on tower operators to switch trains to the correct tracks and on telegraphers and telephoners for instructions, these individuals may have to work nights and weekends. Undesirable shifts are assigned to those who have the least seniority.

Training, Other Qualifications, and Advancement

Jobs as telegraphers, telephoners, and tower operators are filled from the ranks of clerical workers according to seniority provi-

Track Workers

(D.O.T. 859.683-018, 869.687-026, 910.682-010)

Nature of the Work

A major factor limiting train speed is the quality of the track. Many locomotives are capable of pulling hundreds of cars at speeds as fast as 75 miles an hour, but train speed must drop sharply on poorly maintained track to avoid accidents. Preventing track deterioration and the accompanying loss in railroad efficiency is the job of track workers, who service, repair, and replace railroad track and roadway.

Most track workers are members of large, heavily mechanized production crews which do scheduled preventive maintenance and major repair work over hundreds of miles of track. Many of these workers operate heavy machinery, such as bulldozers, cranes, and machines to lay rail, replace ties, or clean ballast. Others use power tools to drive and pull spikes, cut rails, and tighten bolts. Handtools, such as picks and shovels, are used less frequently.

Section crews, which are smaller and less mechanized than the production ones, do less extensive repairs. They are assigned a smaller section of track to keep in condition between the major overhauls of the production crews. Section workers regularly inspect the track and roadway, and repair or replace malfunctioning switches, weak ties, cracked rails, washouts, and other defects.

Working Conditions

Track workers have strenuous and active jobs. The tools they use are fairly heavy and they often work in bent and stooped positions.

Since track workers on production crews work over a large section of track, some workers must commute long distances to reach the work site. Many others live in camp cars or trailers provided by the railroad. To minimize delays in rail service, workers on section crews are always on call. They must be available to make emergency repairs at all hours of the day or night in all kinds of weather conditions.

Training, Other Qualifications, and Advancement

New track workers are hired as laborers, usually on production crews. They serve a 60-day probationary period, although it takes several more months before they are proficient at their work. As they gain seniority they may bid for openings in machine operating jobs. Laborers usually first advance to small, portable machines, such as those used to pull or drive spikes. After acquiring additional seniority, they may get jobs operating heavy, rail-mounted machines.

Railroads prefer applicants who can read,



Tower operator uses controls to throw switches on the tracks below.

sions. It may take several years for a newly hired clerk to acquire sufficient seniority to advance to one of these positions.

New telegraphers, telephoners, and tower operators receive on-the-job training that covers operating rules, train orders, and station operations. On most roads, trainees must pass examinations on train operating rules and demonstrate their ability to use the equipment before they can qualify. Newly qualified workers usually are assigned to the "extra board" to work as substitutes for telegraphers, telephoners, and tower operators who are absent due to vacations, illness, or other reasons. After gaining enough seniority, they generally can bid for regular assignments.

Telegraphers, telephoners, and tower operators should be responsible and alert. In addition, tower operators should be capable of organizing their thoughts and actions in emergency or pressure situations. Good hearing and eyesight, including normal color vision, are required.

A few telegraphers, telephoners, and tower operators advance to positions as station agent or train dispatcher.

Employment Outlook

Employment of telegraphers, telephoners, and tower operators—who numbered about 9,700 in 1978—is expected to decline

through the 1980's. A small number of clerks will be promoted to replace experienced workers who retire, die, or change occupations.

Employment in these fields will continue to decline as the railroads make wider use of mechanized yard operations, centralized traffic control, and other automatic signaling and control systems which can direct train traffic more effectively than telegraphers, telephoners, and tower operators.

Earnings

In 1978, hourly earnings for telegraphers, telephoners, and tower operators averaged \$7.34, about one-third more than the average for all nonsupervisory workers in private industry, except farming. A 40-hour week is standard, and time and one-half is paid for overtime.

Most telegraphers, telephoners, and tower operators are members of the Brotherhood of Railway, Airline and Steamship Clerks, Freight Handlers, Express and Station Employees.

Related Occupations

Other railroad clerical occupations are accounts adjustable clerks, demurrage clerks, dispatcher clerks, documentation-billing clerks, interline clerks, yard clerks, waybill clerks, and car checkers.



Laying track is a strenuous job.

write, and do heavy work. Applicants may be required to pass physical examinations.

Some track workers who have the necessary seniority and other qualifications may advance to gang or section supervisor, then to positions such as track supervisor.

Employment Outlook

Employment of track workers—who numbered about 59,000 in 1978—is not expected to change through the 1980's. But employment is expected to increase in the short run as funds for track renovation become availa-

ble through government action. Opportunities should be best in the Northeast where much of the renovation is taking place.

Railroads are expected to upgrade much of the right-of-way to increase efficiency, and the speed and extent of this renovation will determine the need for additional workers. Over the long run, however, increased productivity of track workers—as machines do more of the work—will limit employment needs. In addition, railroads will continue to close sections of track that are unprofitable or are made unnecessary as the installation of improved train control systems enable railroads to use less track. Despite this lack of growth, new track workers will be needed each year to replace experienced workers who retire, die, or transfer to other occupations. Most job openings will be in production crews.

Earnings

In 1978, track workers averaged \$6.58 an hour, slightly more than the average for all nonsupervisory workers in private industry, except farming. Equipment operators and helpers averaged \$7.03 and crew supervisors averaged \$7.29 an hour. A 40-hour workweek is standard, and premium rates are paid for overtime. Track workers who have little seniority, especially those working on the northern railroads, may be furloughed during the winter months.

Most track workers are members of the Brotherhood of Maintenance of Way Employees.

Related Occupations

Jobs similar to those of track workers can be found in other construction fields. Laborers as well as operators of cranes, bulldozers, power shovels, and other heavy machines are needed to construct highways, streets, and buildings.

Driving Occupations

Over 2.7 million truck, bus, and taxi drivers moved passengers and goods over highways and city streets in 1978. While some drivers are behind the wheel practically all their working time, many others also spend part of the day loading and unloading goods, making pickups and deliveries, and collecting money. Route drivers do some selling as well as driving. For this reason they are discussed in the chapter on sales occupations elsewhere in the *Handbook*. The individual sections that follow cover long-distance and local truckdrivers, intercity and local busdrivers, parking attendants, and taxi drivers. Not covered are school busdrivers, chauffeurs, ambulance drivers, or employees for whom driving is only incidental to their regular duties.

Employment of long-distance and local truckdrivers is expected to expand through the 1980's as more and more freight is moved by truck. Employment of local transit busdrivers also is expected to increase as cities expand their transit systems. Employment in other driving occupations is not expected to change much, but many new employees will be hired to replace those who retire, die, or stop working for other reasons.

Driving 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 persons also will enjoy the freedom from close supervision and the frequent contact with people that are characteristic of most driving jobs.

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. Although drivers must always be alert to prevent accidents, they must be especially careful 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 conditions.

Before arriving at major terminals, they announce the stop and the scheduled departure time. At some small stations, drivers stop only if they see passengers waiting or if they have been told to pick up or deliver freight. Drivers also regulate lighting, heating, and air-conditioning equipment for the passengers' comfort. If repair service is not available, they are required to change flat tires.

Upon arriving at their final destinations, drivers prepare reports for their employers on mileage and time as required by the U.S. Department of Transportation. They also report any repairs the buses need before being used again.

Drivers working for small bus companies sometimes have additional duties. These may include loading and unloading baggage and freight, fueling buses, and performing light maintenance.

At times, drivers operate chartered buses. In these cases, they pick up a group of people, take them to the group's destination, and remain with them until they are ready to return. These trips frequently require drivers to remain away from home one night or more.

Working Conditions

Since intercity buses operate at all hours of the day and 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 have to 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 hours off and shall not drive at all after being on duty for 15 hours.

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.

Places of Employment

Over 23,000 intercity busdrivers were employed by about 1,050 bus companies in 1978. 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.

Training, Other Qualifications, and Advancement

Intercity busdrivers must meet qualifications established by the U.S. Department of Transportation. 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 in each eye with or without glasses, and normal use of their arms and legs. In addition, they must take 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.

Most intercity bus companies conduct training programs for new drivers. These programs, which usually last from 2 to 8 weeks, include both classroom and driving instruction. In the classroom, trainees learn about rules of the company and the U.S. De-



Intercity busdriver receives instructions prior to run.

partment of Transportation, about State and municipal driving regulations, and about safe driving practices. They also learn how to determine ticket prices and how to keep records. In addition, new employees learn to deal courteously with passengers.

Trainees spend considerable time learning and practicing driving skills. Courses are set up and trainees practice turns, zig-zag maneuvers, backing up, and driving into narrow lanes. As they gain experience, they begin driving 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. A good deal of practice is necessary before trainees can adapt their automobile driving skills to these larger vehicles. After completing the training, which includes final driving and written examinations, new drivers begin a "break in" period. During this period, they make regularly scheduled trips with passengers, 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 better driving assignments in the form of higher earnings or a more leisurely route. Experienced drivers may be promoted to jobs as dispatchers, supervisors, or terminal managers.

Employment Outlook

Employment of intercity busdrivers is not expected to change through the 1980's. Some openings will become available each year, however, because of the need to replace experienced drivers who retire, die, or transfer to other occupations. Since many qualified persons are attracted to this relatively high-paying job, applicants can expect stiff competition for the openings that arise. Applicants in excellent physical condition who have good driving records stand the best chance of being hired.

Intercity passenger travel will grow as population and income increase, but buses are not expected to share in this growth. Instead, higher incomes will enable more people to travel by plane. Although more expensive, air travel provides faster service over long distances.

Earnings

Drivers employed by large intercity bus companies had estimated average annual earnings of \$18,900 in 1978, about three-quarters more than the average for all non-supervisory 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, they receive additional pay, customarily at premium rates.

Most intercity busdrivers belong to the Amalgamated Transit Union. The Brotherhood of Railroad Trainmen and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.) also have organized these workers in some areas of the country.

Related Occupations

Other occupations which involve driving heavy vehicles are hostler, local transit busdriver, local truckdriver, and long-distance truckdriver.

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

Local transit busdrivers relieve millions of Americans of the bother of fighting city traffic every day. 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 the terminal or garage to which they are assigned. Large cities have several garages while a small city may have only one. At the garage, drivers are given transfer and refund forms. Some are assigned buses and drive them to the start of their run. Others go to designated intersections and relieve drivers who are going off duty. Drivers inspect the inside and outside of the buses and check the tires, brakes, windshield wipers, and lights before starting their runs. Those who work for small bus companies also may check the water, oil, and fuel.

On most runs, drivers pick up and discharge passengers at locations marked with a bus stop sign. As passengers board the bus, drivers make sure the correct cash fare,

token, or ticket is placed in the fare box. They also collect or issue transfers. Drivers often answer questions about schedules, routes, and transfer points and sometimes call out the name of the street at each bus 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 avoid letting light traffic put them ahead of schedule so that they do not miss passengers.

Busdrivers especially must be alert to the traffic around them. Since sudden stops or swerves will jar standing passengers, drivers try to anticipate traffic developments, not react to them.

At the end of the day, busdrivers turn in trip sheets which usually include a record of fares received, trips made, and any significant delays in schedule. They also turn in a report on the mechanical condition of their bus that day. In case of an accident, drivers must make out a report describing 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 are ready to return.

Working Conditions

Driving a bus is not physically strenuous, but busdrivers may suffer nervous strain and fatigue from maneuvering a large vehicle through heavy traffic while dealing with passengers. However, most local busdrivers enjoy steady year-round employment and work without close supervision.

Places of Employment

About 77,000 local busdrivers were employed in 1978, primarily in large cities. About 85 percent worked for publicly owned transit systems. Most of the remainder worked for 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 of average height and weight, be in good health, and have good eyesight, with or without glasses. Most employers require applicants to pass a physical examination and a written test that determines if they are capable of following the often complex schedules busdrivers use. Although educational requirements are not high, many employers prefer applicants who have a high school education or its equivalent. A relaxed personality is important since drivers face many minor aggravations each day due to traffic congestion, bad weather, and the many different personalities they must deal with.

A motor vehicle operator's license is a basic requirement and a good driving record is essential. Most States require busdrivers to have a chauffeur's license, which is a commercial driving permit.

Most local transit systems conduct training courses that may last several weeks and include both classroom and "behind-the-wheel" driving instruction. In the classroom, trainees learn work rules, safety regulations, and safe driving practices. They also learn how to read schedules and keep records and how to deal tactfully and courteously with passengers. Actual driving instruction may

begin with several hours of instruction on a training course, but trainees quickly advance to practice on city streets. Because a busdriver is seated above other traffic, defensive driving—seeing and avoiding possible traffic dangers ahead of time—has much potential and is stressed. Trainees are assigned to a particular garage and must memorize and drive each of the runs based at this garage before graduating. They also take several trips with passengers while supervised by an experienced driver. At the end of the course, trainees may have to pass a written examination and a driving examination.

Most 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. These drivers also are assigned the many extra and special runs required each day. For example, new drivers make most of the extra trips needed during morning and evening rush hours. They also drive the extra buses added to routes leading 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 operate these buses. New drivers remain on the extra list until they have enough seniority to get a regular run. This may take several years.

The different 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, although experienced drivers may advance to jobs as instructors, supervisors, or dispatchers. Supervisors patrol the bus routes and check whether drivers are on schedule. If a schedule becomes impossible to meet due to heavy traffic, a blocked street, or some other problem, the supervisor may re-route buses. Dispatchers work in the transit system's main office and organize the day-to-day bus operation by coordinating all activity. They assign buses to drivers, determine that drivers are available for all runs, call extra list drivers to substitute if full-time drivers will be out, and keep a record of the drivers and buses that were assigned to each run. A few drivers advance to management positions. Promotion in publicly owned bus systems is usually by competitive civil service examination.

Employment Outlook

Employment of local busdrivers is expected to increase faster than the average for all occupations through the 1980's. In addition, many job openings will result from the need to replace drivers who transfer to other occupations, retire, or die.

The increased use of privately owned automobiles in cities and the population shift to the suburbs—where most people drive their own cars—has caused a decline in bus passengers and driver employment.



Busdriver determines that correct fare is deposited.

However, in urban areas, the automobile now is recognized as the main source of air pollution and traffic congestion. As part of the effort to reduce the number of cars used by commuters, many cities are trying to improve local bus service. Express lanes reserved for buses on city streets, more convenient routes, and more comfortable buses reflect the interest of Federal, State, and local government in providing better bus service. Improved bus service will require more drivers.

Earnings

According to a survey of union contracts in 62 large cities, local busdrivers averaged \$7.53 an hour in 1978, about one-third more than the average for all nonsupervisory workers in private industry, except farming. Hourly wages were highest in the larger cities.

The workweek for regular drivers usually consists of any 5 days during the week; Saturdays and Sundays are counted as regular workdays. Some drivers have to work evenings and after midnight. To accommodate the demands of commuter travel, many local busdrivers have to work "split shifts." For example, a driver may work from 6 a.m. to 10 a.m., go home, and then return to work from 3 p.m. to 7 p.m. Drivers may receive extra pay for split shifts.

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. The United Transportation Union and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America also have organized some local busdrivers.

Related Occupations

Other driving occupations in local transit include streetcar operator and subway operator. Other occupations which involve driving heavy vehicles on highways and city streets are intercity busdriver, local truckdriver, and long-distance truckdriver.

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 this cargo at terminals for intercity shipment, as well as final delivery of goods from terminals to stores and homes in the area, 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 truck and arranged the items in order of delivery to minimize handling of merchandise.

At the customer's place of business, drivers generally load or unload the merchandise. If there are heavy loads such as machinery, or if there are 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 the deliveries made. They also report whatever repairs the trucks need before being used again.

The work of these drivers varies, depending on the product they transport. Produce truckers, on the one hand, pick up a loaded truck in the early morning and spend the rest of the day delivering the product 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. Night or early morning work is sometimes necessary, particularly for drivers handling foodstuffs for chain grocery stores, produce markets, or bakeries. Most drivers deliver over regular routes, although some may be assigned 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 when drivers make many deliveries during a day, their work can be exhausting. Moreover, driving in heavy traffic can cause nervous strain. Local truckdrivers, however, do have certain work advantages. Employment is steady and, unlike long-distance drivers, they usually work during the day and return home in the evening.

Places of Employment

About 1.7 million people worked as local truckdrivers in 1978, mostly in and around large cities. Some drivers are needed 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, however, applicants must have a chauffeur's license, which is a commercial driving permit. Information on how to get this license can be obtained from State motor vehicle departments. 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 gained in the Armed Forces. A person also may obtain such 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. 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 efficient operation



About 1.7 million people worked as local truckdrivers in 1978.

and loading of a truck, company policies, and the preparation of delivery forms and company records.

Although most new employees 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.

Employment Outlook

Employment of local truckdrivers is expected to grow about as fast as the average for all occupations through the 1980's. In addition to the job openings from growth, thousands of openings will result from the need to replace experienced drivers who transfer to other occupations, retire, or die. Job openings may vary from year to year, however, since the number of drivers needed fluctuates with general business

conditions. Applicants with good driving records have the best chance of being hired.

The rise in total business activity anticipated in the years ahead will increase the amount of freight to be distributed. Since trucks carry virtually all local freight, employment of drivers will grow.

Earnings

On the average, union wage scales were \$9.10 an hour for local truckdrivers and \$8.18 an hour for helpers in 1978, according to a survey in 66 large cities. This is about 1 1/2 times as much as the average for all non-supervisory workers in private industry, except farming. As a rule, local truckdrivers are paid by the hour and receive extra pay for working overtime, usually after 40 hours.

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 busdriver, long-distance truckdriver, hostler, and route driver and deliverer.

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 and highways carrying goods between terminals that are 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 "turn-arounds." 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 to complete, and they remain away from home overnight. Often on these 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 and may transport freight to the same city on a regular basis. But demand for trucking service fluctuates, with shippers requesting 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. Although many drivers work during the day, night travel is common and frequently preferred because roads are less crowded and trips take less time.

When drivers report for work, the trucks already have been loaded and serviced with fuel and oil. But, before moving from the terminal, drivers inspect the trucks to make sure they will operate safely. For example, they make sure the brakes, windshield wipers, and lights are working and that a fire extinguisher, flares, and other safety equipment have been loaded. Mirrors are adjusted so that both sides of the truck are visible from the driver's seat. Drivers also make sure the cargo has been loaded properly and will not

shift after the trip has begun. 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, or vans surrounding 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 have reached their destination and have parked at the unloading platform, drivers complete reports about the trip and the condition of the truck. Both are 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 the gas stations' storage tanks. When picking up or delivering furniture, drivers of long-distance moving vans hire local labor, which they supervise, to help them load or unload the vans.

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 very long runs, work fairly close to the maximum hours permitted.

Places of Employment

An estimated 584,000 long-distance drivers were employed in 1978. 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 products. A significant number of drivers are owner-operators. These drivers own their trucks and either operate independently or lease their



About 584,000 long-distance truckdrivers were employed in 1978.

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.

To be hired, drivers must have a good driving record and must pass a road test to show they can operate a vehicle of the type and size they will drive 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.

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.

A more common method of entering truckdriving is to start as a dockworker, loading and unloading freight. As dockworkers gain experience in the general trucking operation, they 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 start as dockworkers. 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 the various 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 who have 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.

Employment Outlook

Employment of long-distance truckdrivers is expected to increase about as fast as the average for all occupations through the 1980's. In addition to jobs from employment growth, thousands of openings will be created in this large occupation as experienced drivers retire, die, or transfer to other fields of work. Job opportunities may vary from year to year, however, because the amount of freight moved by trucks fluctuates with ups and downs in the economy. Since driver earnings are high and no formal training is required, applicants can expect to face strong competition for available jobs.

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.

Earnings

Based on limited information, drivers employed by large trucking companies had annual average earnings of about \$29,000 in 1978, about double the average for all non-

supervisory workers in private industry, except farming. 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, such as bakeries and dairies, may pay drivers who work for them 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 busdriver, local truckdriver, and hostler.

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.

Parking Attendants

(D.O.T. 915.473-010)

Nature of the Work

Parking lots provide a convenient place to leave our cars while we work, shop, or enjoy a restaurant meal or movie. Typically, when a car enters a lot, a parking attendant records the time of arrival on a numbered claim check. One part of the check is placed on the car's windshield and the other is given to the driver, who produces it later to identify and reclaim the car.

In lots where cars are parked bumper to bumper, parking attendants may ask customers how long they expect to stay so their cars can be parked in a area that will be accessible when they return.

Attendants often drive the cars to and from vacant spaces, but at many facilities drivers park their own cars. Attendants working in multilevel garages may be assigned to only one level, but the usual practice is for attendants to work all levels.

Some parking lots require customers to pay when entering the lot and usually charge

a flat fee for the day or evening. Others charge by the hour, and attendants must determine the correct amount owed by each customer. In many large establishments, and in a number of lots where customers park their own cars, automatic machines dispense the claim check as the car enters. A cashier, rather than an attendant, then collects payment as the car leaves. Slack periods are common at most parking facilities. However, attendants may be required to perform routine maintenance jobs such as cleaning and sweeping the lot.

Working Conditions

Attendants often work long hours—over the weekend, on holidays, and in the evening. Although there are many slow periods during the workday, attendants must move quickly during the morning and afternoon rush hours so that customers will not be delayed.

Attendants at an outdoor parking lot work in all kinds of weather and those working in indoor parking garages may be exposed to high levels of exhaust fumes during peak business hours.

Although some companies may require attendants to pay for any damage they cause to customers' cars, the parking lot's insurance normally covers the cost of repairs.

Places of Employment

About 44,000 parking attendants were employed in 1978. Parking attendants work in facilities ranging from the small outdoor lot near the neighborhood movie theater to the large parking garage in the business district of a major city. A parking lot or garage usually is a commercial establishment and often is a part of a city, regional, or national chain. Although many restaurants, hotels, and stores maintain their own lots, it is also a common practice to rent parking space for their customers in commercial garages. Many cities own and operate their own lots in downtown areas.

Many parking attendants work part time, usually in the evening and on weekends. Most part-time attendants are students.

Training, Other Qualifications, and Advancement

Employers prefer high school graduates for this job, and are likely to give special consideration to applicants who have completed driver's education courses. Parking attendants must have a valid driver's license, be able to drive a car with a standard transmission, and have good eyesight and peripheral vision. Applicants with experience driving many different types of cars are preferred. Attendants must be able to keep records of claim tickets, compute parking charges, and make change.

Attendants should be in good physical condition because the work involves long periods of standing and can be tiring when

many cars must be moved in a hurry. Parking attendants should be neat, tactful, and courteous when dealing with the public.

Most parking attendants are trained on the job. Beginners may "ride" with an experienced worker for a few hours or days to become familiar with the work. Many employers provide on-the-job training programs that review proper driving techniques and explain company policy on recordkeeping procedures and damage claims. These courses usually include tips on how to maintain good customer relations.

Some attendants become managers of a parking lot or garage. An outstanding worker may eventually supervise several facilities. Supervisors regularly meet with parking lot managers. They may stop by from time to time to check the appearance of the parking facility, and to see how attendants handle their work.

Students interested in management jobs in the parking industry should consider part-time or summer jobs as attendants, because even large companies want their employees to have first-hand experience with the business.

Employment Outlook

Employment of parking attendants is expected to grow more slowly than the average for all occupations through the 1980's as the trend to self-parking systems continues. Parking lot owners prefer the self-park method because it is less costly, and most customers prefer to park and lock their own cars rather than wait for a busy attendant.

Although employment growth is expected

to be slow, turnover in this occupation, especially among new workers, is higher than average. The need to replace these workers and those who retire or die will create additional job openings each year. Part-time and evening work will be available. Most job opportunities will be in large commercial parking facilities in urban areas.

Earnings

Many attendants receive tips in addition to their salaries. Therefore, total earnings will vary. In self-parking lots, tipping generally is rare; however, in lots where workers drive the customer's car to and from the parking space, tips may make up a large part of total earnings.

The starting salary for parking lot attendants (exclusive of tips) is often the minimum wage. The Federal minimum was \$2.90 an hour in 1979, but some cities and States have minimum wage laws that establish higher rates. Experienced attendants who have taken on additional responsibility normally earn higher salaries.

Many parking attendants receive benefits such as life, health, and disability insurance; pension plans; paid vacations; a Christmas bonus; and profit sharing. Some companies furnish uniforms.

The principal union organizing parking attendants is the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America.

Related Occupations

Several kinds of outdoor work involve operating, directing, or servicing cars and trucks. Among the workers in these jobs are truck drivers, taxi drivers, bus drivers, car

wash attendants, and automobile service station attendants.

Sources of Additional Information

For general information about the parking industry and parking attendants in particular, write:

National Parking Association, 1101 17th St. NW., Washington, D.C. 20036.

Taxicab Drivers

(D.O.T. 913.463-018)

Nature of the Work

In practically all communities, taxicabs are an essential part of the public transportation system. Unlike buses and subways, which run on fixed routes and schedules, taxis offer individualized service. They pick up and drive passengers directly to their destination from any location.

Most taxicab drivers either work directly for a cab company or rent their cabs from a company. Others own their taxicabs and operate independently. Whether they are employees, renters, or owners, cab drivers have the same duties. Many cabs are fitted with two-way radios so a dispatcher can pass on information about customers who are waiting for rides. Between radio calls, or just by preference, drivers may cruise busy areas in search of customers. Drivers also may wait at hotels, bus terminals, and other places where they expect business to be good.

Because cab drivers either rent their cabs or work on a commission, the more business they get, the higher their earnings. Therefore, experienced drivers often plan their entire day. They know that different parts of the city will have potential customers at different times of the day. They may cruise the business district during rush hour and the shopping centers in the afternoon. Smart drivers also know where crowds are likely to gather. For example, drivers may go to the airport the evening a convention is coming to town, drop by the station when a train is scheduled to arrive, or stop at the stadium at the end of a ball game.

Occasionally, drivers may help passengers in and out of the cab and may handle their luggage. In some communities, drivers regularly transport handicapped children to and from school. Cab drivers also may provide sightseeing tours for out-of-town visitors and may pick up and deliver packages. In small companies, drivers often are responsible for keeping their cabs clean.

Drivers must record the date, time, and place passengers were picked up and their destination, time of arrival, and fare. Knowing where a driver was during the day serves many purposes, including protecting the driver from mistaken identification in case of a customer complaint.



Attendants should be neat, tactful, and courteous when dealing with the public.

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The more business cab drivers get, the higher their earnings.

Working Conditions

Many full-time drivers start work between 6 and 8 a.m. to be available for passengers going to work, and quit after the evening rush of passengers returning home. During the day they may rest for several hours. Other drivers work nights, starting between 3 and 5 p.m., and some work on Saturdays, Sundays, and holidays.

Driving a cab is not physically demanding but driving in congested traffic, especially during rush hours, can be very stressful and mentally fatiguing. Also, having to sit behind the wheel for prolonged periods can be uncomfortable.

Places of Employment

In 1978, about 94,000 taxicab drivers worked full time. Although taxicab drivers are employed in all but the smallest cities, employment is concentrated in large metropolitan areas. About one-fifth of all full-time taxi drivers work in New York City.

Training, Other Qualifications, and Advancement

Taxi drivers usually must have a State-issued chauffeur's license and a special taxicab operator's license issued by the local police, safety department, or Public Utilities Commission. Requirements for a taxicab operator license vary from city to city, but applicants generally must be in good health, have a good driving record, and be free of any convictions for serious crimes.

In most large communities, applicants for

a taxi driver's license also must pass a written examination covering questions about local traffic and taxicab regulations and about the geography of the community, such as the location of important streets and buildings.

Since the procedure of getting a license may seem complicated, applicants are advised first to visit cab companies for which they would like to work. Most companies will explain what is required and how to go about getting a license. Some will also help applicants prepare for the examination.

Although no minimum education is required, many companies prefer applicants who have completed at least the eighth grade. Applicants also must be able to write legibly to fill out the forms drivers are required to maintain. Because of automobile insurance regulations, a large number of taxicab companies hire only applicants who are at least 21, and in some cases, 25 years old. In some States, however, companies may hire applicants who are only 18.

People interested in a job as a taxicab driver should enjoy meeting people and driving. Tact and courtesy are important. A relaxed personality also is an asset, since drivers deal with heavy city traffic most of the day. Successful drivers also must be capable of motivating themselves, since their earnings depend directly on their ability and hard work.

Because opportunities for advancement are limited by the small number of supervisory positions, promotion to dispatcher is often the only possibility. Some drivers, however, have become road supervisors, garage

superintendents, or claims agents. A few develop administrative skills and advance to managerial positions in the company. To increase their income, many drivers buy and operate their own cabs.

Employment Outlook

Opportunities for employment should be excellent through the 1980's. Although employment of taxicab drivers is expected to remain unchanged, the high turnover of employed drivers should create many jobs.

Many taxicab drivers are temporary employees. Some work to earn money until they finish school or find the job they want; others work only in the winter and return to seasonal, outdoor work when spring arrives, still others work to earn money for a special purpose, such as a vacation. Whenever these drivers have obtained other jobs or paid their bills, they quit. As a result, many taxicab driving jobs usually are available.

Earnings

In 1978, a private survey reported that taxi drivers averaged \$3.90 an hour, including tips. Drivers working directly for a company are paid a percentage—usually between 40 and 50 percent—of their fares for the day. These drivers also may be guaranteed a certain minimum income if fares are low one day. Information from several union contracts indicated that these guarantees ranged from \$14 to \$18.50 a day in 1978. Other taxi drivers rent cabs from a company by the day for a set fee and keep any receipts above the cab rental and gasoline expenses. In addition, drivers frequently receive tips ranging from 10 to 20 percent of the fare.

Many taxi drivers in large cities, particularly those who work for the taxicab companies belong to labor unions. Most drivers are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America. Other unions to which cab drivers belong include the Seafarers' International Union of North America and the Brotherhood of Railway, Airline and Steamship Clerks, Freight Handlers, Express and Station Employees.

Related Occupations

Other occupations that involve driving an automobile or transporting people include bus driver, chauffeur, driving instructor, and delivery service driver.

Sources of Additional Information

For further information on job opportunities in this field, contact local cab companies or the local office of the State employment service.

SCIENTIFIC AND TECHNICAL OCCUPATIONS

The efforts of our scientific and technical work force result in improvements in many areas of American life. New products, increased productivity, greater defense capabilities, environmental protection, and advances in health care are examples of the achievements of scientists, engineers, and technicians.

Almost 3 million people (nearly one-quarter of all professional workers) were engineers, scientists, or other scientific and technical workers in 1978.

Engineers

Engineers play a prominent role in bringing scientific progress into our everyday lives. They use scientific and mathematical principles to design and produce new and improved products and to solve practical technical problems such as ways of improving automobile engines to increase gas mileage. Most engineers work in private industry—primarily in industries manufacturing machinery, electrical equipment, and aircraft, and in firms providing engineering and architectural services.

Engineers usually specialize in one of the branches of engineering. (The *Handbook* discusses 12 of these branches.) Many engineers further specialize in an industry such as the motor vehicle industry.

Engineers design, develop, and test equipment; work in the production departments of manufacturing firms; and sell technical products and provide technical assistance to industrial customers. Some work in supervisory and management jobs in which knowledge of engineering is required.

Scientists

Scientists seek knowledge of nature and of the physical world through observation, study, and experimentation. Some scientists develop new products and processes from scientific discoveries. The largest group of scientists study the scientific principles of the physical world; this group includes chemists, physicists, and environmental scientists. Almost three-quarters of all physical scientists are chemists. Most chemists work in private industry; over one-quarter are in chemical manufacturing. One-quarter of all physical scientists are physicists. Most physicists work in colleges and universities, teaching and doing research, or in private industry—mostly in companies that manufacture aerospace and defense-related products.

Environmental scientists study the Earth, its oceans, and its atmosphere. Their work increases understanding of our planet and helps in controlling pollution, discovering and developing natural resources, and in weather prediction. This group includes geologists, meteorologists, and oceanographers. The largest environmental science occupation is that of geologist. Most geologists work in petroleum extraction industries and in colleges and universities.

Life scientists study life processes and living organisms, from the largest animals to the smallest microbes. The majority teach or do research in colleges and universities. Biological scientists are the largest group of life scientists. Medical scientists has been the fastest growing group within the life sciences over the past two decades.

Mathematicians and statisticians also are considered natural scientists. Some mathematicians devote all their time to theoretical research, while others apply mathematical principles to practical problems. Both mathematicians and statisticians work to quantify solutions to problems in science, management, and engineering. Statisticians collect, analyze, and interpret the numerical results of surveys, quality control tests, or economic and business research programs. In doing so, they assist managers and administrators in making decisions.

Conservationists

Conservationists protect, develop, and manage natural resources such as forests, rangelands, wildlife, soil, and water. By protecting and conserving these assets now, conservationists help assure that future needs will be met.

Foresters help insure that the Nation's forests are used properly. Through the forester's management and research efforts, forests can continually meet many competing uses such as lumber production, recreation, and support of wildlife. Foresters often are assisted by forestry technicians, sometimes called forestry aides.

Range managers determine how rangeland can best support livestock grazing while still conserving it for other uses such as wildlife grazing and recreation.

Soil conservationists provide farmers, ranchers, and others with technical assistance and advice on how to conserve soil and water resources.

Other Scientific and Technical Personnel

There are more than one million workers in other scientific and technical occupations. These persons work as engineering and science technicians, food technologists, broadcast technicians, drafters, and surveyors.

Engineering and science technician jobs are more practical and limited in scope than those of engineers and scientists. The more highly skilled jobs, however, require the ability to analyze and solve engineering and science problems and to prepare reports on tests and experiments.

Technicians who work in research and development set up complex laboratory equipment and help design scientific instruments. Those who work in production jobs test and inspect products and act as a liaison between engineering and production departments. Others sell technical products, install complex equipment, and provide technical services to industrial customers.

Food technologists search for better ways to commercially process and preserve food. They also ensure the quality of food by conducting quality control tests and by supervising food production.

Broadcast technicians ensure the technical quality of radio and television broadcasts by operating and maintaining sound recorders, television cameras, video tape recorders, and other electronic equipment.

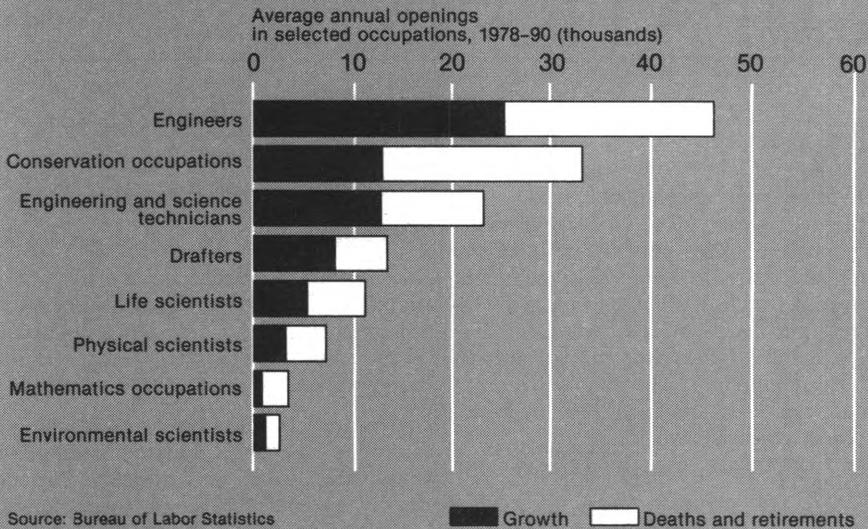
Drafters prepare detailed drawings which show dimensions, material requirements, and other specifications for engineers, architects, and designers.

Surveyors measure construction sites, establish official land boundaries, assist in setting land valuations, and collect information for maps and charts.

Training, Other Qualifications, and Advancement

A bachelor's degree is usually needed to enter scientific and engineering jobs. However, in some fields such as mathematics, physics, and the life sciences an advanced degree is usually required for entry into most higher level jobs. For some occupations, such as astronomer, a doctorate is required for full professional status. A bachelor's degree is sufficient for entry into most engineering jobs, and some senior engineering technicians with less than a bachelor's degree are occasionally promoted to engineering jobs.

The number of openings in scientific and engineering occupations varies greatly by occupational group



Undergraduate training for scientists and engineers includes courses in their major field and in related science areas, including mathematics. Courses in statistics and computer programming are useful. Students are usually required to take courses in English and a foreign language, as well.

In graduate school, students usually take courses in their major area of study, as well as courses in mathematics and related sciences. Requirements for the master's or doctor's degree vary by institution, but usually include a thesis, which is a report of the results of the student's own original research.

Students who want to specialize in a particular area of study should select their school carefully. For example, those who plan to become biomedical engineers or biochemists and work in medicine should study at a university affiliated with a hospital. Those who want to be agricultural scientists can get the most practical training at State universities that have agricultural experiment stations.

Technicians acquire training in many ways. Some complete on-the-job training programs, take formal courses part time while working, or obtain training in the

Armed Forces. Many employers, however, seek graduates of specialized training programs. One- to four-year training programs are offered in postsecondary schools—technical institutes, junior and community colleges, area vocational technical schools, and colleges and universities.

Outlook

Opportunities in scientific and technical occupations are expected to expand through the 1980's. In the past, growth in these occupations has been related to an expanding economy and to increased R&D (research and development) expenditures, especially by the Federal Government. Both government and industry are expected to increase their R&D expenditures through the 1980's, although they will increase them more slowly than during the 1960's. If the rate of economic growth and actual R&D levels and patterns differ significantly from those assumed, the outlook in many occupations would be altered.

Scientists, engineers, and other scientific and technical workers will be needed to develop new technologies and better products. In addition, many technically trained people will be required to solve urgent problems such as air, water, and noise pollution, to develop new sources of energy, and to combat disease.

The following sections of the *Handbook* provide detailed information for 4 conservation occupations, 12 engineering specialties, 12 scientific occupations, including life, physical, environmental, and mathematical scientists, and 5 related scientific and technical occupations.

Conservation Occupations

Forests, rangelands, soil, and water are important natural resources. Our rangelands and forests, for example, yield raw materials, support livestock, serve as habitats for wildlife, and provide recreation for hikers, campers, and others who enjoy the outdoors. As our population has grown, the demands on these natural resources have greatly increased. The demands often are conflicting. We need timber, for example, but we also need forests for hiking and camping, and to help protect our water supplies. In some cases, recreational needs conflict with the need to protect fragile areas from overuse. As a result, there is a need for planning the use of our natural resources in order that we may gain multiple benefits from them. Workers in the conservation occupations are responsible for protecting, managing, and developing these resources, both to make them more productive today, and available for future generations.

Persons interested in careers in conservation must have specialized training. Foresters, range managers, and soil conservationists generally need bachelor's degrees in their fields. Technical school training usually is required for positions as forestry technicians.

A common element of conservation jobs is outdoor work. Although much time is spent in natural sometimes even spectacular settings, the job involves more than solitary communion with nature. Workers in these occupations are finding it increasingly necessary to be able to deal with people, to communicate their technical expertise and environmental concern to the various groups of people who use these natural resources.

In addition to technical knowledge and communication skills, conservation workers must have a sincere interest in our natural resources and a desire to protect them. Flexibility also is important, since they may work in a remote camping area 1 week, speak to a community group the next, and fight a forest or brush fire the next.

This section describes four conservation occupations—forester, forestry technician, range manager, and soil conservationist.

Foresters

(D.O.T 040.061-034)

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, and protect our water

supplies and wildlife, as well as provide recreational opportunities for people. With all of these multiple demands made upon them, forests must be managed, developed, and protected, or they will simply not be available for use by future generations. Foresters are the trained professionals who help manage, develop, and protect our vital forest resources.

Foresters plan and supervise the growing, protection and utilization 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 may be responsible for 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. Some of these areas are recognized as distinct professions.

Working Conditions

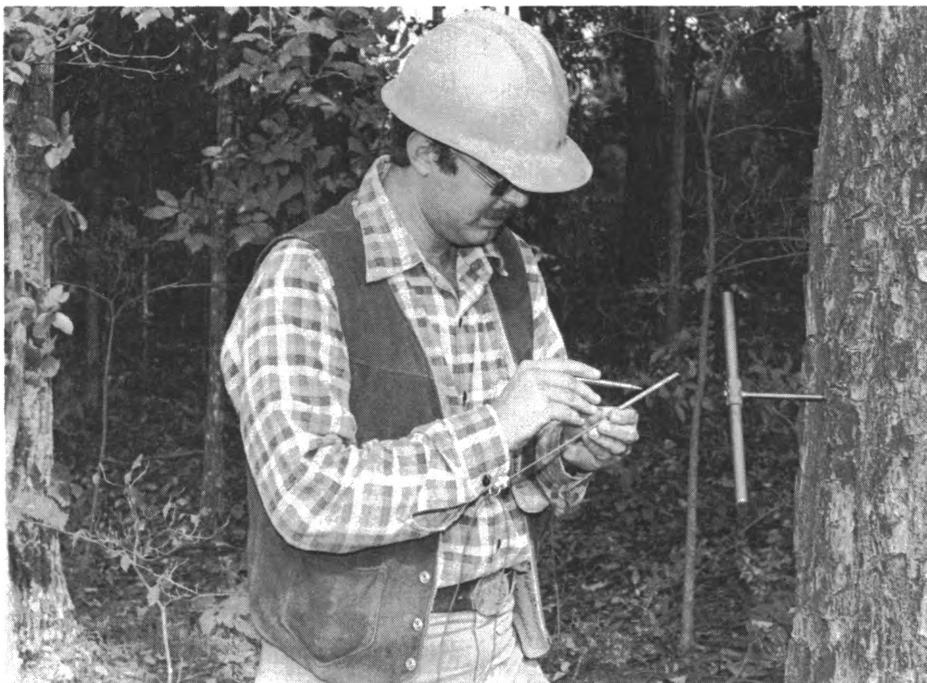
Working conditions for foresters vary considerably, according to the type of work they perform. The old image of foresters as solitary horseback riders, singlehandedly protecting large areas of land far from civilization, however, no longer holds true. Modern foresters spend a great deal of time working with people. They must deal constantly with landowners, loggers, forestry aides, and a wide variety of other people.

The work still can 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.

Many experienced foresters advance to jobs in the office where they use maps and computers to plan and organize the activities of the staff.

Places of Employment

Over 25,000 persons worked as foresters in 1978. Nearly 2 out of 5 worked in private industry, mainly for pulp and paper, lumber, logging, and milling companies. About one-fourth worked for the Federal Government, primarily in the Forest Service of the Department of Agriculture. The remainder worked



Foresters take core samples from trees to assess the age and growth rate of timber stands.

for State and local governments, colleges and universities or consulting firms, or were self-employed either as consultants or forest owners.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in forestry is the minimum educational requirement for persons desiring 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 work, high school students who are considering careers in forestry should get as broad an educational background as they can. Students should, however, take as many science courses as possible, including 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 1978 by 50 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 firsthand 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.

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.

Employment Outlook

Employment of foresters is expected to grow about as fast as the average for all occupations through the 1980's. In recent years, however, the number of persons earning degrees in forestry has exceeded the number of openings in the field. 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 who can offer an

employer either an advanced degree or several years' experience.

The country will need more foresters to ensure an increasing output of forest products. Employment also may increase as we become more aware of the need to conserve and replenish our forest resources, and to improve the environmental quality of our forest lands.

Private owners of timberland may well employ more foresters as they recognize the need for—and the higher profitability of—improved forestry and logging practices. The forest products industry will require additional foresters to apply new techniques for using the entire forest crop, to develop methods of growing superior trees in a shorter period of time, and to do research in the fields of plant genetics and fertilization.

Employment of foresters will probably continue to grow faster in private industry than in the Federal Government where budget limitations may restrain growth. State government agencies will probably hire more foresters through Federal-State cooperative programs for fire control, protection against insects and disease, recreation, and technical assistance to owners of forest lands.

The expected rapid increase in the employment of technicians for routine tasks will enable the forester to spend more time in supervising and managing the forest.

Earnings

According to the limited data available, the average starting salary for foresters in 1978 was about \$12,000 a year, while experienced foresters averaged over \$20,000.

In private industry, starting foresters averaged \$12,000 a year in 1978 and the overall average salary was \$21,000.

Graduates entering the Federal Government as foresters in early 1979 with just a bachelor's degree started at \$10,507 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 \$13,014 a year. Ph. D.'s generally started at \$15,920 or \$19,263 a year. The median annual salary in 1979 for federally employed foresters exceeded \$22,000.

In local government, foresters generally began at over \$10,000 a year in 1978, while their median annual salary was \$16,000. Starting salaries in State governments were about \$10,600 in 1978, and State median salaries were \$17,000 per year. College professors generally started at about \$14,000 annually in 1978, while their median salary was over \$22,000 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 our 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, lists of reading materials, and lists of schools offering education in forestry are available from:

Society of American Foresters, 5400 Grosvenor Lane, Washington, D.C. 20014.

National Forest Products Association, 1619 Massachusetts Ave. NW., Washington, D.C. 20036.

General career information also is available from:

American Forest Institute, 1619 Massachusetts Ave. NW., Washington, D.C. 20036.

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, Washington, D.C. 20250.

Forestry Technicians

(D.O.T. 451.687, 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. For example, they help estimate present and potential timber production 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 the trees will yield and then 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 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.

Places of Employment

About 13,000 persons worked year round as forestry technicians in 1978. Nearly the same number found temporary employment—primarily with Federal and State Governments—during the summer or in the spring and fall fire seasons.

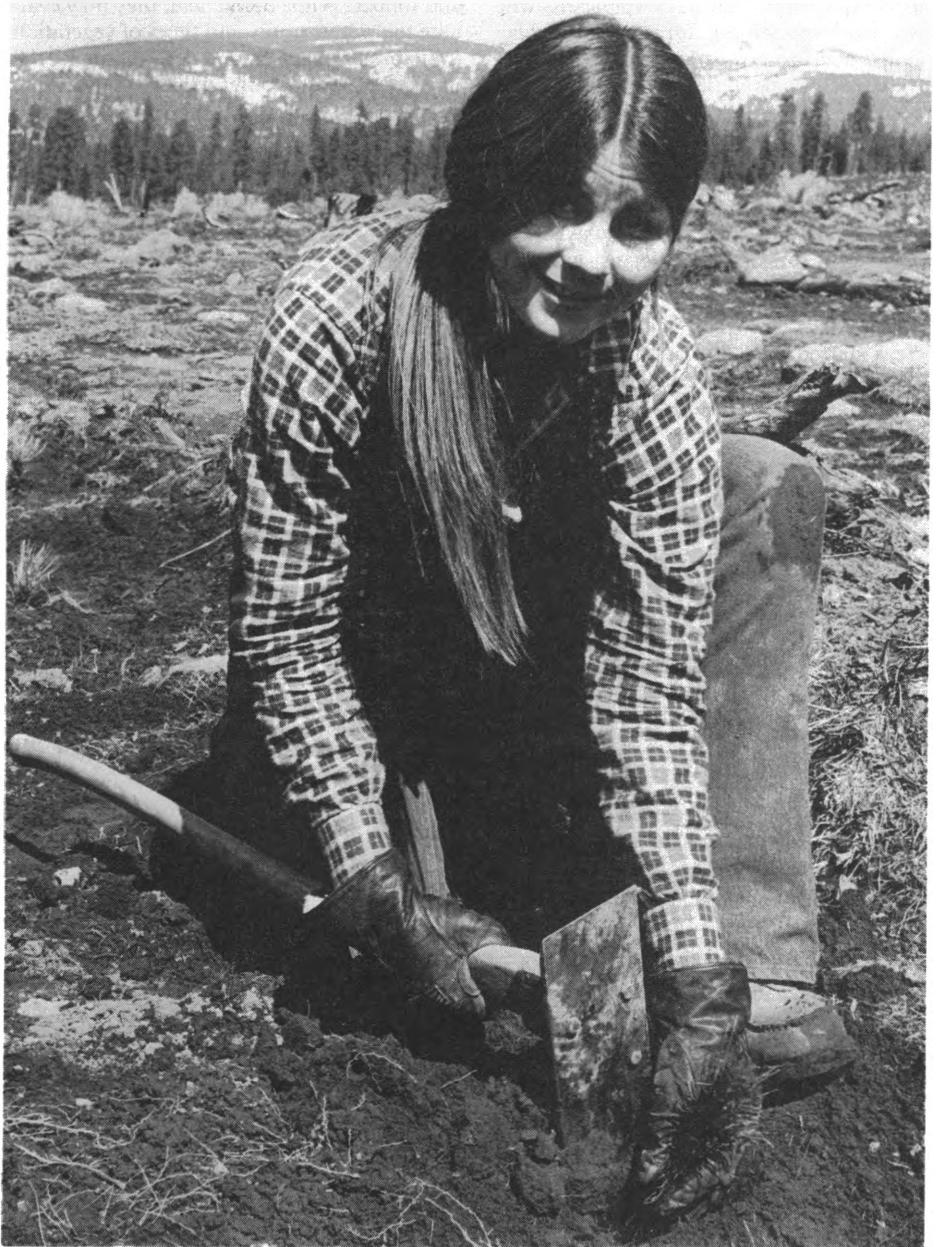
Nearly half the year-round total worked in private industry, mainly for logging, lumber, and paper companies. Reforestation projects of mining, oil, and railroad companies—as well as employment in tree nurseries—accounted for the remainder of the workers in private employment. The Federal Government employed about 4,000 full-time forestry technicians in 1978, primarily in the Forest Service of the U.S. Department of Agriculture, while over 2,000 more 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 post-secondary 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 1978.

Most forestry technician schools require graduates to complete 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. To gain practical experience, students may be required to



Planting new seedlings is an important part of the forestry technician's job.

work in a forest or camp operated by the school.

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.

Employment Outlook

Growth in employment of forestry technicians is expected to be faster than 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 substan-

tially in the future, this keen competition for jobs is expected to continue. Applicants who have had specialized forestry technician training and some practical experience may have better opportunities.

Earnings

Starting salaries of forestry technicians ranged from \$8,000 to \$10,000 a year in 1978, according to the limited data available; experienced forestry technicians averaged about \$13,000.

In the Federal Government, forestry technicians started at \$8,366 or \$9,391 a year in early 1979 depending on education and experience. Experienced forestry technicians in the Federal Government averaged about \$13,000 annually.

Related Occupations

Forestry technicians work mostly outdoors, usually in a natural setting. Other nonprofessional workers who have a similar job environment include artificial inseminators, buckers, cowpunchers, 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, Washington, D.C. 20250.

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.

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, habitats for livestock and wildlife, water from vast watersheds, facilities for water sports and other kinds of recreation, 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 optimize 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. While in the field, they may evaluate the water supply and types of vegetation available, take soil samples, and estimate the number of deer or other wildlife on the land.

Range managers restore and improve rangelands through controlled burning, re-seeding, 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 carry out range conservation and development plans that provide water for grazing animals, erosion control, and fire prevention.

Not all of a range manager's time is spent outdoors. Office work is not unusual. The range manager may consult with other conservation specialists, prepare written reports, and do administrative work.

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 often spend considerable time away from home and work outdoors in all kinds of weather. Employers generally supply small planes, cars, or, in rough country, four-wheel vehicles or horses for range managers to use to get around. Occasionally they may walk.

There is much more to the job than simply riding the range, however. Range managers must constantly deal with other people, including the public, ranchers, government agencies, and persons who specialize in other areas of conservation. In some cases, they may work as part of a team.

Many range managers advance to administrative jobs where they write reports, attend meetings or supervise the clerical staff.

Places of Employment

About 3,500 persons worked as range managers in 1978. The majority 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. Many foreign countries, however, are now beginning to train their own citizens in range management.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in range management or range science is the usual minimum educational requirement for range managers. In the Federal Government, a degree in a closely related field, such as agronomy or forestry, including courses in range management and range science, also may be accepted. Inasmuch as Federal agencies may upgrade their requirements and hire only range management graduates, a degree in range management is strongly recommended for persons who want to enter this field. Graduate degrees in range management generally are required for teaching and research positions, and may be helpful for advancement in other jobs.

In 1978, about 20 colleges and universities offered degree programs in range management or range science. A number of other schools offered course work 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, computer science, forestry, hydrology, wildlife, 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.

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 for range work.

Employment Outlook

Employment of range managers is expected to grow faster than the average for all occupations through the 1980's. Job opportunities throughout this period are expected to be good for persons who have degrees in range management or range science. Also, a few jobs may be filled by persons with degrees in related fields who have had some range management courses.

The growing demand for red meat, wildlife habitat, 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



Range managers spend much of their time working outdoors, often in remote areas.

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 mine 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 hiring for these activities depends heavily upon legislation concerning the management of range resources, as well as budgetary limitations, personnel ceilings and program priorities.

Earnings

In the Federal Government, range managers with a bachelor's degree started at either \$10,507 or \$13,014 a year in early 1979 depending on their college grades. Those having 1 or 2 years of graduate work began at \$13,014 or \$15,920; persons with Ph. D. degrees started at either \$15,920 or \$19,263. Range managers with the Federal Government averaged about \$20,000 a year in 1978.

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 our 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, Col. 80204.

For information about career opportunities in the Federal Government, contact:

Bureau of Land Management, Denver Service Center, Federal Center Building 50, Denver, Colo. 80255.

Forest Service, U.S. Department of Agriculture, Washington, D.C. 20250.

Soil Conservation Service, U.S. Department of Agriculture, Washington, D.C. 20250.

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 and water. 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 develop a program to combat the erosion. For example, if the erosion is caused by water runoff on sloped fields, the conservationist may recommend ways to terrace the land, or construct waterways for the runoff that do not remove soil. If erosion results

from wind, the conservationist may recommend growing hedges in places that will provide windbreaks or may suggest improved methods of farming, such as 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 this land, however, can be made suitable for grazing livestock if proper water conservation techniques are used. Soil conservationists inspect rangeland and recommend to farmers 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 in order 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.

In addition to working with individual farmers and ranchers, soil conservationists work as technical advisors to Soil and Water Conservation Districts when solving area-wide land management problems. A Soil and Water Conservation District is made up of a group of individuals within a county who are concerned with, and responsible for, conservation problems within the area. Soil conservationists working with conservation districts prepare maps of the district, or parts of the district, depicting particular problems of soil and water conservation. They then use the maps to plan and develop a conservation program for the entire area, whether it is 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 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. They spend a good deal of time, for example, working directly 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 check the root systems of vegetation planted to help prevent erosion.

soil conservationists may confer with other conservation workers, as well as representative landowners and other concerned persons.

Places of Employment

About 9,000 soil conservationists were employed in 1978, mostly by the Federal Government in the U.S. 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. In addition to those who work for the Federal Government, 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, especially those employed by the Soil Conservation Service, have degrees in agronomy, agricultural education, or general agriculture. A few soil conservationists have degrees in related fields of the natural resource sciences, such as wildlife bi-

ology, forestry, and range management. Programs of study generally must include 30 semester hours in natural resources or agriculture, including at least 3 hours in soils.

A background in agricultural engineering is very helpful to soil conservationists, and courses in cartography, or mapmaking, also are helpful. Soil conservationists must be able to communicate well with people, 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 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.

Employment Outlook

Employment of soil conservationists is expected to increase about as fast as the average for all occupations through the 1980's. In addition to employment growth, several hundred openings will occur each year from the need to replace conservationists who die, retire, or transfer to other occupations. For example, even though employment of conservationists in the Soil Conservation Service has not increased over the past decade, the Department of Agriculture has hired, on the average, about 400 new conservationists each year.

Employment growth will occur in banks, public utilities, and other organizations that make loans on agricultural lands or that have large holdings of farm or ranch lands. Many of these organizations are adding conservationists to their staffs to help preserve the value of farmlands on which they hold mortgages or to help them comply with recent conservation and antipollution laws. 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. However, because this is a very attractive job choice for many people, competition may make it difficult to find jobs in this field.

Earnings

Soil conservationists who had a bachelor's degree and were employed by the Federal Government received \$10,507 a year in early 1979. Advancement to \$13,014 could be expected after 1 year of satisfactory service. Those who had outstanding records in college, or who had a master's degree, started at \$13,014 and could advance to \$15,920 after 1 year. Further advancement depends upon

the individual's ability to accept greater responsibility. Earnings of well-qualified Federal soil conservationists with several years' experience range from \$19,263 to \$32,442 a year.

Related Occupations

Other workers who use science to help conserve and protect our natural resources

include animal scientists, agronomists, aquatic biologists, biomedical engineers, foresters, geneticists, horticulturists, plant pathologists, range managers, soil scientists, and wood technologists.

Sources of Additional Information

Additional information on employment as a soil conservationist may be obtained from

the Employment Division, Office of Personnel, U.S. Department of Agriculture, Washington, D.C. 20250; or any office of the Department's Soil Conservation Service.

Engineers

The work of engineers affects our lives in thousands of ways. Their accomplishments have enabled us to drive safer automobiles, reach the moon, and prolong life through special machinery. Future accomplishments could help increase energy supplies, develop more pollution-free powerplants, and aid medical science's fight against disease.

In 1978, about 1.1 million persons were employed as engineers. Engineering is the second largest professional occupation, exceeded only by teaching. Most engineers specialize in 1 of the more than 25 specialties 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 engineering problems of one industry, such as motor vehicles, or in a particular 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. The challenge of solving technical problems is a source of satisfaction to many engineers. Often their work is the link between a scientific discovery and its

useful application. Engineers design machinery, products, systems, and processes for efficient and economical performance. They develop electric power, water supply, and waste disposal systems to meet the problems of urban living. They design industrial machinery and equipment used to manufacture 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 design and develop consumer products such as automobiles, television sets, and refrigerators, 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 new 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 of the new device, as well as its cost and reliability. This design process applies to most products, including those as different as medical equipment, electronic computers, and industrial machinery.

In addition to design and development, many engineers work in testing, production, operation, or maintenance. They supervise the operation of production processes, deter-

mine the causes of breakdowns, and perform tests on newly manufactured products to ensure that quality standards are maintained. They also estimate the time and the cost needed to complete engineering projects. Still others work in administrative and management jobs where an engineering background is necessary, or in sales jobs where they 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*.) Engineers with considerable education or experience sometimes work as consultants. Some with advanced degrees teach in the engineering schools of colleges and universities.

Engineers within each of the branches apply their specialized knowledge to many fields. Electrical engineers, for example, work in the medical, computer, missile guidance, or electric power distribution fields. Because engineering problems are usually complex, the work in some fields cuts across the traditional branches. Using a team approach to solve problems, engineers in one field often work closely with specialists in other scientific, engineering, and business occupations.

Engineers often use calculators or computers to solve mathematical equations that help specify what is needed for a device or structure to function in the most efficient manner. Engineers also spend a great deal of time writing reports of their findings and consulting with other engineers. Because of the complexity of most of the projects on which they are involved, many engineers work with only a small portion of the total project. Some are responsible for an entire project and may supervise other engineers.

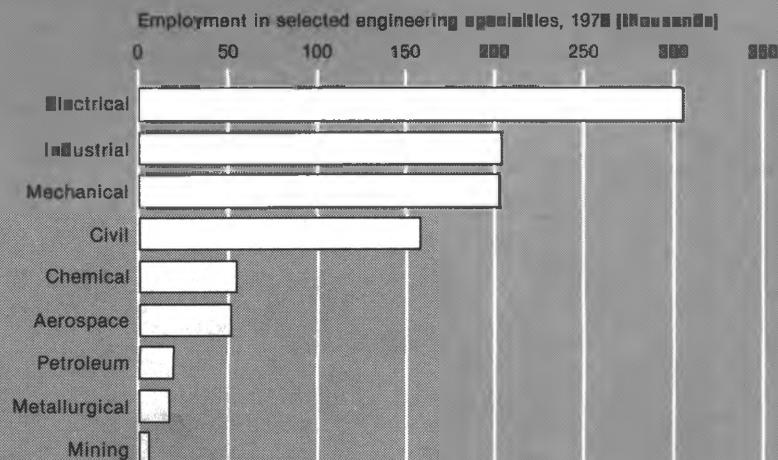
Working Conditions

Most engineers spend a great deal of their time in offices; some are at a desk almost all of the time. But some engineers work in research laboratories or in industrial plants. Engineers in specialties such as civil engineering may work outdoors part of the time. Although not typical, some engineers travel extensively to their firm's or client's plants or construction sites. Some may put in considerable overtime to meet deadlines, often without additional compensation.

Places of Employment

Almost half of all engineers work in manufacturing industries—mostly in the electrical and electronic equipment, aircraft and parts, machinery, chemicals, scientific instruments, primary metals, fabricated metal products, and motor vehicle industries. About 400,000 were employed in nonmanufacturing industries in 1978, primarily in construction, pub-

About three-quarters of all engineers are electrical, industrial, mechanical, or civil engineers



Source: Bureau of Labor Statistics

lic utilities, engineering and architectural services, and business and management consulting services.

Federal, State, and local governments employed about 150,000 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 almost 50,000 engineers in research and teaching jobs, and a small number worked for non-profit 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 the generally accepted educational requirement for beginning engineering jobs. College graduates trained in one of the natural sciences or mathematics also may qualify for some beginning 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. These programs prepare students for practical design and production work rather than for jobs that require more theoretical scientific and mathematical knowledge. Graduates of 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 somewhere between those of a technician and an engineer.

Graduate training is essential for most beginning teaching and research positions but is not needed for the majority of other entry level engineering jobs. Many engineers obtain master's degrees, however, because an advanced degree often is desirable for promotion or is needed to keep up with new technology. Some specialties, such as nuclear or biomedical engineering, are taught mainly at the graduate level.

About 240 colleges and universities offer a bachelor's degree in engineering, and almost 70 colleges offer a bachelor's degree in engineering technology. Although programs in the larger branches of engineering are offered in most of these institutions, some small specialties are taught in only a very few. Therefore, students desiring specialized training should investigate curriculums before selecting a college. Admissions requirements for undergraduate engineering schools usually include high school courses in advanced 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, social sciences, and English. The last 2 years are devoted, for the most part, to specialized engineering courses. Some programs offer a general engineering curriculum, permitting the student to 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 now offer 5-year master's degree programs. In addition, several engineering schools have formal arrangements with liberal arts colleges whereby a student spends 3 years in a liberal arts college studying preengineering subjects and 2 years in an engineering school and receives a bachelor's degree from each.

Some schools have 5- or even 6-year cooperative plans where students coordinate classroom study and practical work experience. In addition to gaining useful experience, students can thereby finance part of their education. Because of the need to keep up with rapid advances in technology, engineers often continue their education throughout their careers.

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 1978, there were over 300,000 registered engineers. Generally, registration requirements include a degree from an accredited engineering school, 4 years of relevant work experience, and the passing of a State examination.

Engineering graduates usually begin work under the supervision of experienced engineers. Some companies have programs to acquaint new engineers with special industrial practices and to determine the specialties for which they are best suited. Experienced engineers may advance to positions of greater responsibility, and some move to management or administrative positions after several years of engineering. Some engineers obtain graduate degrees in business administration to improve their advancement opportunities, while still others obtain law degrees and become patent attorneys. Many high level executives in private 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 to technical skills, it is important that engineers be able to express themselves well—both orally and in writing.

Employment Outlook

Employment opportunities for those with degrees in engineering are expected to be good through the 1980's. In addition there may be some opportunities for college graduates from related fields in certain engineering jobs.

Employment of engineers is expected to increase slightly faster than the average for all occupations through the 1980's. In addition to job openings created by growth, many openings are expected to result from the need to replace engineers who will die, retire, or transfer to management, sales, and other professional jobs.

Much of the expected growth in requirements of engineers will stem from industrial expansion to meet the demand for more goods and services. More engineers will be needed in the design and construction of factories, utility systems, office buildings, and transportation systems, as well as in the development and manufacture of defense-related products, scientific instruments, industrial machinery, chemical products, and motor vehicles.

Engineers will be required in energy-related activities developing sources of energy as well as designing energy-saving systems for automobiles, homes, and other buildings. Engineers also will be needed to solve environmental problems.

Since the number of degrees expected to be granted in engineering in the 1980's is substantially higher than the number granted recently, some graduates may experience competition for engineering employment if the economy enters a recession or if research and development expenditures do not increase as expected. Further, if the demand for their specialty declines, engineers may lose their jobs. This can be a particular problem for older engineers, who may face difficulties in finding other engineering jobs. These difficulties can be minimized by selection of a career in one of the more stable industries and engineering specialties, and by continuing education to keep up on the latest technological developments.

Despite these problems, over the long run the number of people seeking jobs as engineers is expected to be in balance with the number of job openings.

(The outlook for various branches is discussed in the separate statements later in this section.)

Earnings



According to the College Placement Council, engineering graduates with a bachelor's degree and no experience were offered average starting salaries of \$16,800 a year in private industry in 1978; those with a master's degree and no experience, \$18,700 a year; and those with a Ph. D., over \$24,000. Starting offers for those with the bachelor's degree vary by branch as shown in the accompanying table.

In the Federal Government in early 1979, engineers with a bachelor's degree and no experience could start at \$13,657 or \$16,920 a year, depending on their college records. Those with a master's degree could start at \$18,044, and those having a Ph. D. degree could begin at \$19,263. Mining and petroleum engineers could begin at higher salaries,

Table 1. Average starting salaries for engineers by branch, 1978

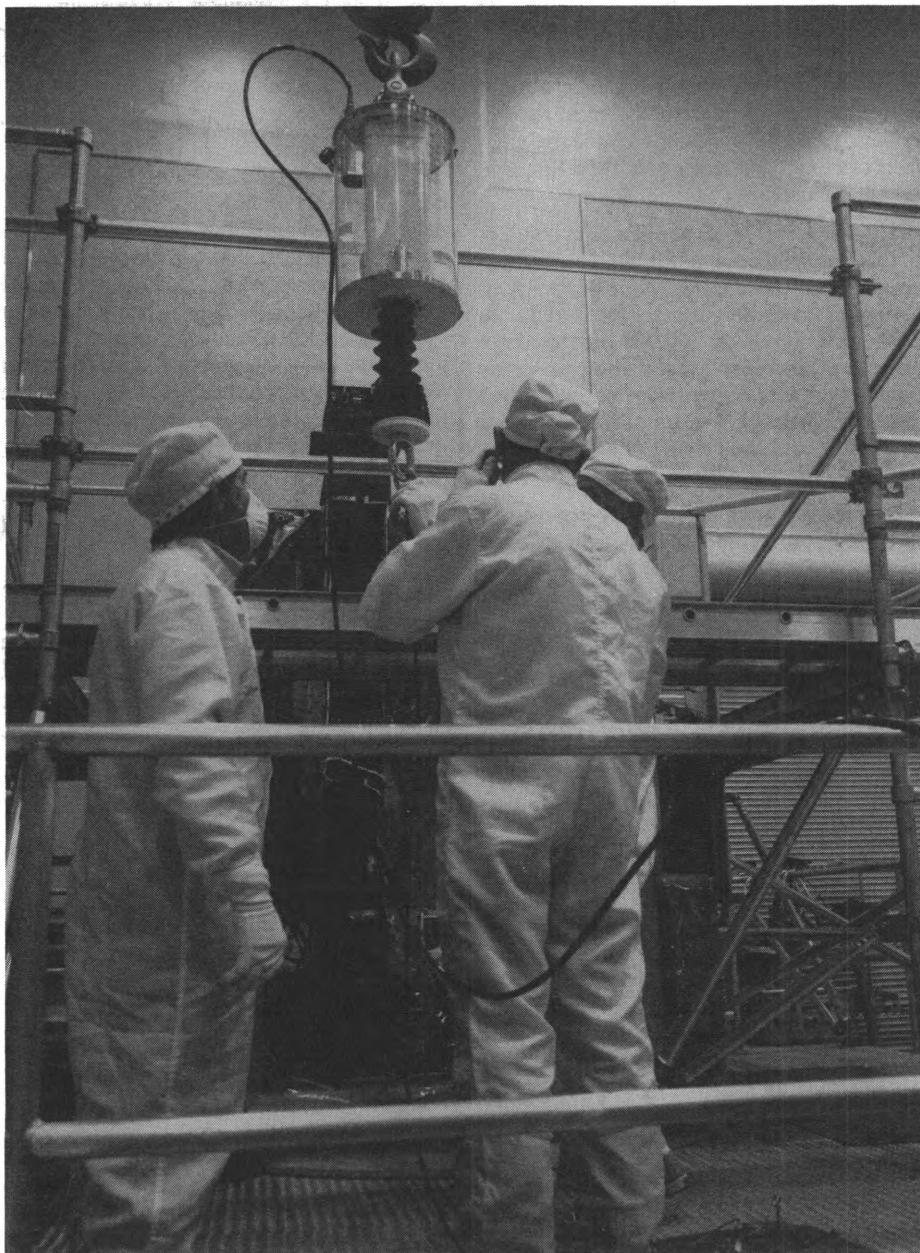
| Branch | Salary |
|-------------------------------------|----------|
| Petroleum engineering | \$19,836 |
| Chemical engineering | 18,156 |
| Mining engineering | 17,964 |
| Metallurgical engineering | 17,016 |
| Mechanical engineering | 16,848 |
| Electrical engineering | 16,404 |
| Industrial engineering | 16,380 |
| Aeronautical engineering | 16,248 |
| Civil engineering | 15,456 |

SOURCE: College Placement Council.

and certain other specialties in some geographic areas also were offered higher salaries. The average salary for experienced engineers in the Federal Government was about \$27,700 in 1979.

For a 9-month academic college year in

1978, faculty members with 5 years' experience beyond the bachelor's degree received about \$15,150; those with 18 to 20 years experience beyond the bachelor's degree received about \$21,150. (See statement on college and university faculty elsewhere in the *Handbook*.)



Aerospace engineers testing spacecraft components.

According to an Engineering Manpower Commission survey, the average salary for engineers with 20 years of experience was \$30,500 in 1978. Some in management positions had much higher earnings.

Related Occupations

Engineering is the largest scientific and technical occupation. Other occupations whose work involves related areas of science or technology include environmental scientists, life scientists, physical scientists, mathematicians, engineering and science technicians, and architects.

Sources of Additional Information

General information on engineering careers—including engineering school requirements, courses of study, and salaries—is available from:

Engineers' Council for Professional Development, 345 E. 47th St., New York, N.Y. 10017.

Engineering Manpower Commission of Engineers Joint Council, 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 the engineering profession are listed later in this chapter. Each can provide information about careers in the particular branch.

Aerospace Engineers

(D.O.T. 002.061 except -030, and 002.167)

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 the state of technology in commercial aviation, defense systems, and space exploration.

Aerospace engineers often specialize in an area of work 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.

Places of Employment

About 60,000 aerospace engineers were employed in 1978, mainly in the aircraft and parts industry. Some worked for Federal Government agencies, primarily the National Aeronautics and Space Administration and the Department of Defense. A few worked for commercial airlines, consulting firms, and colleges and universities.



Agricultural engineer explaining how to evaluate a machine's performance.

Employment Outlook

Employment of aerospace engineers, which is largely determined by the level of Federal expenditures on defense and space programs, is expected to grow about as fast as the average for all occupations through the 1980's. Expenditures for the space program are expected to increase only slightly between 1978 and 1990, while defense spending will probably increase moderately. In addition to the jobs that will be created by employment growth, many workers will be required to fill openings created by deaths, retirements, and transfers of workers to other occupations. (See introductory section of this chapter for discussion of training requirements and earnings. See also statement on aircraft, missile, and spacecraft manufacturing elsewhere in the *Handbook*.)

Sources of Additional Information

American Institute of Aeronautics and Astronautics, Inc., 1290 Avenue of the Americas, New York, N.Y. 10019.

Agricultural Engineers

(D.O.T. 013.061)

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 are concerned with the conservation and management of energy, soil, and water resources. Agricultural engineers work in research and development, production, sales, or management.

Places of Employment

Most of the 14,000 agricultural engineers employed in 1978 worked for manufacturers of farm equipment, electric utility companies, and distributors of farm equipment and supplies. Some worked as engineering consultants who supply services to farmers and farm-related industries; others were specialists with agricultural organizations, or managers of agricultural processing plants.

About 450 agricultural engineers were employed in the Federal Government in 1978, mostly in the Department of Agriculture; some were on the faculty of colleges and uni-

versities; and a few worked in State and local governments.

Employment 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 engineers. (See introductory part of this section for information on training requirements and earnings. See also statement on agriculture elsewhere in the *Handbook*.)

Sources of Additional Information

American Society of Agricultural Engineers, 2950 Niles Rd., St. Joseph, Mich. 49085.

Biomedical Engineers

(D.O.T. 019.061-010)

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 the engineering aspects of the biological systems of 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 require a sound background in one of the major engineering disciplines (mechanical, electrical, industrial, or chemical) in addition to specialized biomedical training.

Places of Employment

There were about 4,000 biomedical engineers in 1978. 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. Some work in sales positions.

Employment Outlook

Employment of biomedical engineers is expected to grow faster than the average for all occupations through the 1980's, but the actual number of openings in this small profession is not likely to be very large. Those who have advanced degrees will be in demand to teach and to fill jobs resulting from increased expenditures for medical research. Increased



Some biomedical engineers design and develop medical instruments.

research funds could also create new positions in instrumentation and systems for the delivery of health services. (See introductory part of this chapter for information on training requirements and earnings.)

Sources of Additional Information

Alliance for Engineering in Medicine and Biology, Suite 404, 4405 East-West Highway, Bethesda, Md. 20014.

Biomedical Engineering Society, P.O. Box 2399, Culver City, Calif. 90230.

Ceramic Engineers

(D.O.T. 006.061)

Nature of the Work

Ceramic engineers develop new ceramic materials and methods for making ceramic materials into useful products. Although to some, the word ceramics means pottery, ceramics actually include all nonmetallic, inorganic materials which require the use of high temperature in their processing. Thus, ceramic engineers work on 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 com-

puters possible); protective and refractory coatings for metals; glass; abrasives; cement technology; or fuel elements for atomic energy.

Places of Employment

About 14,000 ceramic engineers were employed in 1978, mostly in the stone, 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.



Ceramic engineers often specialize in one area of ceramics, such as glass or ceramics used in electronic components.

Employment 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 the development of ceramic materials for energy conversion and conservation, should create additional openings. (See introductory part of this section for information on training requirements and earnings.)

Sources of Additional Information

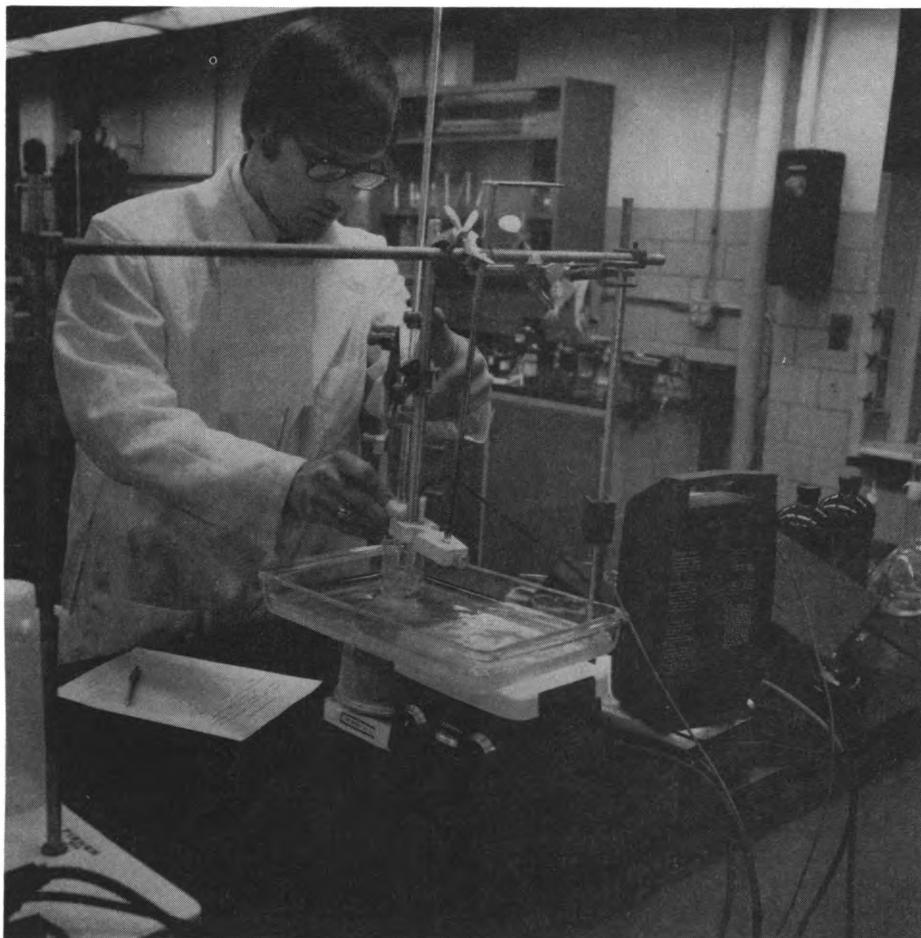
American Ceramic Society, 65 Ceramic Dr., Columbus, Ohio 43214.

Chemical Engineers

(D.O.T. 008.061 and .167-010)

Nature of the Work

Chemical engineers are involved in many phases of the production of chemicals and chemical products. They design equipment and chemical plants as well as determine methods of manufacturing the product. Often, they design and operate pilot plants to test their work and develop chemical processes such as those to remove chemical contaminants from waste materials. Because the duties of chemical engineers cut across many fields, these professionals must have a knowledge of chemistry, physics, and mechanical and electrical engineering.



Chemical engineer doing research on a new production process.

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.

Places of Employment

Most of the 50,000 chemical engineers working in 1978 were in manufacturing industries, primarily those producing chemicals, petroleum, and related products. 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.

Employment 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 industry expansion—the chemicals industry in particular.

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 environmen-

tion for information on training requirements and earnings. See also the statement on chemists and the industrial chemical industry elsewhere in the *Handbook*.)

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.

Civil Engineers

(D.O.T. 005.061 and .167)

Nature of the Work

Civil engineers, who work in the oldest branch of the engineering profession, design and supervise the construction of roads, harbors, airports, tunnels, bridges, water supply and sewage systems, and buildings. Major specialties within civil engineering are structural, hydraulic, environmental (sanitary), transportation (including highways and railways), urban planning, 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.

Places of Employment

About 155,000 civil engineers were employed in 1978. 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



Civil engineer inspect construction projects to insure that plans are followed.

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 must often move from place to place to work on different projects.

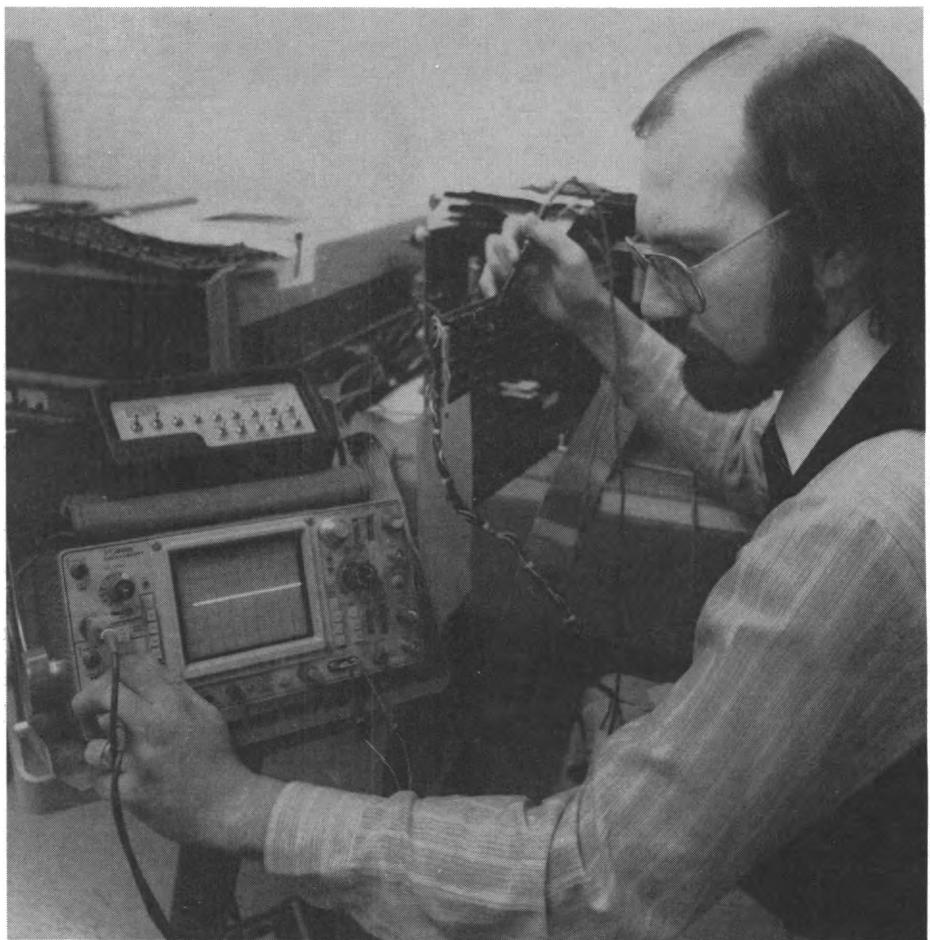
Employment Outlook

Employment of civil engineers is expected to increase about as fast as the average for all occupations through the 1980's. Job opportunities will result from the growing needs for housing, industrial buildings, electric power generating plants, and transportation systems created by a growing population and an expanding economy. Work related to solving problems of environmental pollution and energy self-sufficiency will also require additional civil engineers.

Many civil engineers also will be needed each year to replace those who retire, die, or transfer to other occupations. (See introductory part of this section for information on training requirements and earnings.)

Sources of Additional Information

American Society of Civil Engineers, 345 E. 47th St., New York, N.Y. 10017.



Electrical engineer using an oscilloscope to test electronic circuits in computer equipment.

Electrical Engineers

(D.O.T. 003.061, .167, and .187)

Nature of the Work

Electrical engineers design, develop, test, and supervise the manufacture of electrical and electronic equipment. Electrical engineers who work with electronic equipment often are called electronic engineers. Electrical equipment includes power generating and transmission equipment used by electric utilities, electric motors, machinery controls, and lighting and wiring in buildings, automobiles, and aircraft. Electronic equipment includes radar, computers, communications equipment, and consumer goods such as television and stereo sets. Electrical engineers also design and operate facilities for generating and distributing electric power.

Electrical engineers generally specialize in a major area—such as integrated circuits, computers, electrical equipment manufacturing, communications, or power distributing equipment—or in a subdivision of these areas—microwave communication or aviation electronic systems, for example. Electrical engineers design new products, specify their uses, and write performance requirements and maintenance schedules. They also test equipment, solve operating problems, and estimate the time and cost of engineering projects. Besides employment in research, development, and design, many are in manufacturing, administration

and management, technical sales, or teaching.

Places of Employment

Electrical engineering is the largest branch of the profession. About 300,000 electrical engineers were employed in 1978, mainly by manufacturers of electrical and electronic equipment, aircraft and parts, business machines, and professional and scientific equipment. Many work for telephone, telegraph, and electric light and power companies. Large numbers are employed by government agencies and by colleges and universities. Others work for construction firms, for engineering consultants, or as independent consulting engineers.

Employment Outlook

Employment of electrical engineers is expected to increase about as fast as the average for all occupations through the 1980's. Although increased demand for computers, communications, 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. Many retire, die, or transfer to other fields of work.

(See introductory part of this section for

information on training requirements and earnings. See also statement on electronics manufacturing elsewhere in the *Handbook*.)

Sources of Additional Information

Institute of Electrical and Electronics Engineers/United States Activities Board, 1111 19th St. NW., Washington, D.C. 20036.

Industrial Engineers

(D.O.T. 012.061, .067-010, .167 except -066, and .187)

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 particular 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 produc-



Industrial engineers developing a data processing system.

tion 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.

Places of Employment

About 185,000 industrial engineers were employed in 1978; 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, some work for insurance companies, banks, construction and mining firms, and public utilities. Hospitals, retail organizations, and other large business firms employ industrial engineers to improve operating efficiency. Still others work for government agencies and colleges and universities. A few are independent consulting engineers.

Employment Outlook

Employment of industrial engineers is expected to grow faster than the average for all occupations through the 1980's. The increasing complexity of industrial operations and the expansion of automated processes, along with industry growth, are factors contributing to employment growth. Increased recognition of the importance of scientific management and safety engineering in reducing costs and increasing productivity should create additional opportunities.

Additional numbers of industrial engineers will be required each year to replace those who retire, die, or transfer to other occupations. (See introductory part of this section for information on training requirements and earnings.)



Many mechanical engineers work in maintenance and production operations.

Sources of Additional Information

American Institute of Industrial Engineers, Inc.,
25 Technology Park/Atlanta, Norcross, Ga.
30092.

Mechanical Engineers

(D.O.T. 007.061 except -026 and -030, 007.161-022 and -034, and 007.167-014)

Nature of the Work

Mechanical engineers are concerned with the production, transmission, and use of 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 since many specialties have developed within the field. These specialties include motor vehicles; marine equipment; energy conversion systems; heating, ventilating, and air-conditioning; instrumentation; and machines for specialized

industries, such as petroleum, rubber and plastics, and construction.

Large numbers of mechanical engineers do research, test, and design work. Many are administrators or managers, while others work in maintenance, technical sales, and production operations. Some teach in colleges and universities or work as consultants.

Places of Employment

About 200,000 mechanical engineers were employed in 1978. Almost three-fourths were employed in manufacturing—mainly in the primary and fabricated metals, machinery, transportation equipment, and electrical equipment industries. Others worked for government agencies, educational institutions, and consulting engineering firms.

Employment Outlook

Employment of mechanical engineers is expected to increase about as fast as the average for all occupations through the 1980's. The growing demand for industrial machinery and machine tools and the increasing complexity of industrial machinery and processes will be major factors supporting increased employment opportunities. Mechanical engineers will be needed to develop new energy systems and to help solve environmental pollution problems.

Large numbers of mechanical engineers also will be required each year to replace those who retire, die, or transfer to other occupations. (See introductory part of this section for information on training requirements and earnings. See also statement on occupations in the atomic energy field elsewhere in the *Handbook*.)

Sources of Additional Information

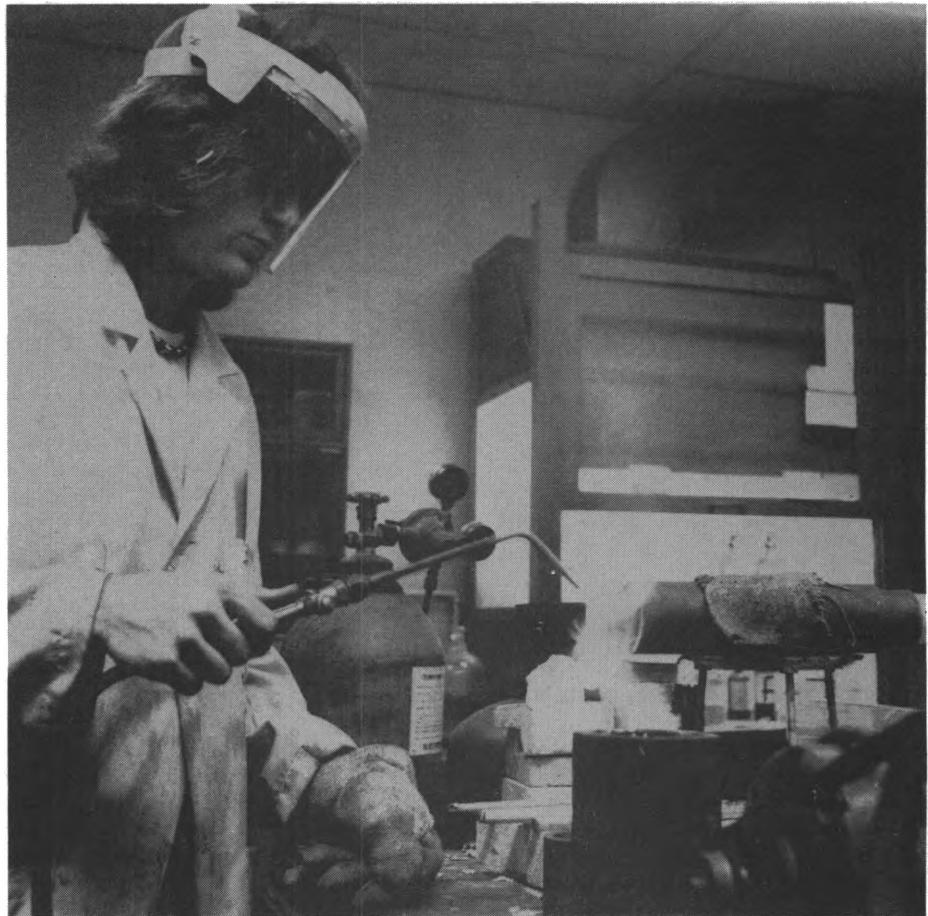
The American Society of Mechanical Engineers, 345 E. 47th St., New York, N.Y. 10017.

Metallurgical Engineers

(D.O.T. 011.061 except -010, and .161.010)

Nature of the Work

Metallurgical engineers develop new types of metal with characteristics that are tailored to meet specific requirements, such as heat resistance, high strength but light weight, or high malleability. They also develop methods to process and convert metals into useful products. Most of these engineers generally 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



Metallurgical engineers study the physical properties of metals.

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 to work and shape metals such as casting, forging, rolling, and drawing. Scientists working in this field are known as metallurgists or materials scientists, but the distinction between scientists and engineers in this field is small.

Places of Employment

The metalworking industries—primarily the iron and steel and nonferrous metals industries—employed over one-half of the estimated 16,000 metallurgical and materials engineers in 1978. 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.

Employment Outlook

Employment of metallurgical and materials engineers is expected to grow faster than the average for all occupations through the 1980's. An increasing number of these engineers will be needed by the metalworking industries to develop new metals and alloys as well as to adapt current ones to new needs. For example, communications equipment,

computers, and spacecraft require lightweight metals of high purity. As the supply of high-grade ores diminishes, more metallurgical engineers will be required to develop new ways of recycling solid waste materials in addition to 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. (See introductory part of this section for information on training requirements and earnings. Also see statement on the iron and steel industry elsewhere in the *Handbook*.)

Sources of Additional Information

The Metallurgical Society of AIME, P.O. Box 430, Warrendale, Pa. 15086.

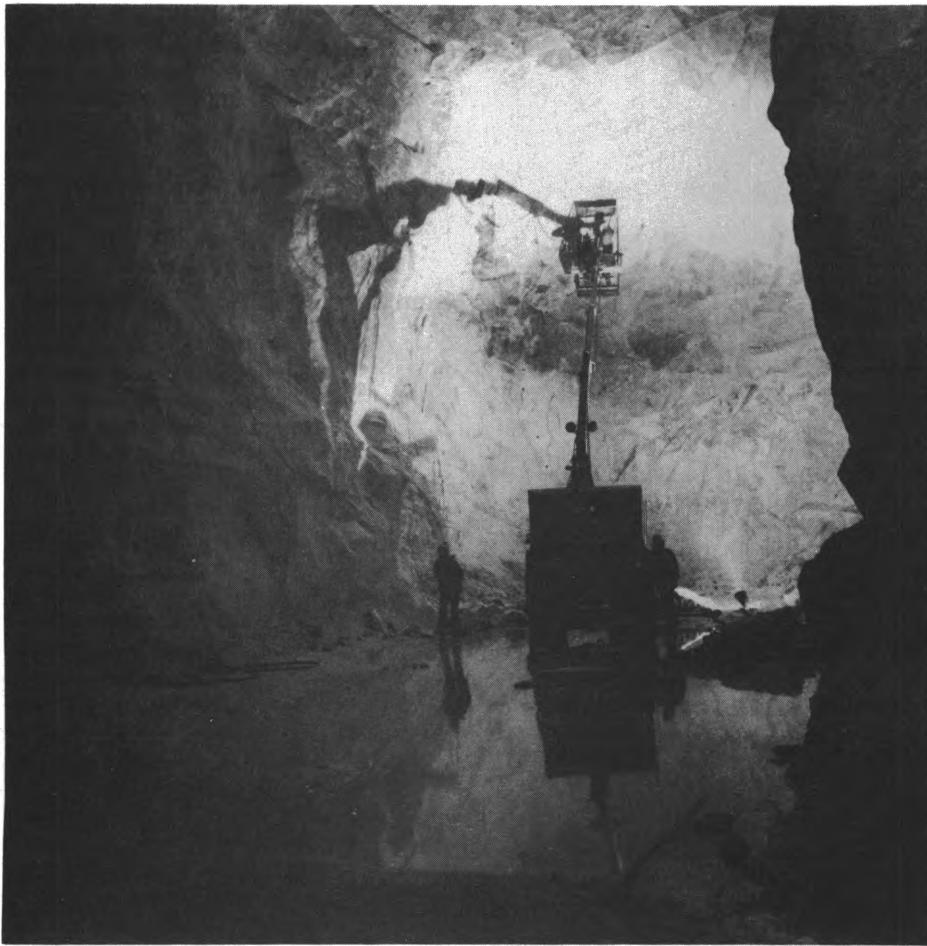
American Society for Metals, Metals Park, Ohio 44073.

Mining Engineers

(D.O.T. 010.061 except -018)

Nature of the Work

Mining engineers find, extract, and prepare minerals for manufacturing industries to use. They design open pit and underground mines, supervise the construction of mine shafts and tunnels in underground op-



Mining engineers are usually employed at the location of mineral deposits.

erations, and devise methods for transporting minerals to processing plants. Mining engineers are responsible for the economical and efficient operation of mines and mine safety, 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, which involve separating minerals from the dirt, rock, and other materials they are mixed with. Mining engineers frequently specialize in the mining of one specific 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.

Places of Employment

About 6,000 mining engineers were employed in 1978. 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.

Employment Outlook

Employment of mining engineers is expected to increase much 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 in the coal industry. 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. (See introductory part of this section for information on training requirements and earnings. See also statement on mining elsewhere in the *Handbook*.)

Sources of Additional Information

The Society of Mining Engineers of AIME, Caller Number D, Littleton, Colo. 80123.

Petroleum Engineers

(D.O.T. 010.061 except -014 and -026, .131-010, .161-010 and -014, .167, and .261-010)

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 best and 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. Even when using the best recovery methods, about half the oil is still left in the ground. Petroleum engineers' research and development efforts to increase the proportion of oil recovered in each reservoir can make a significant contribution to increasing available energy resources.

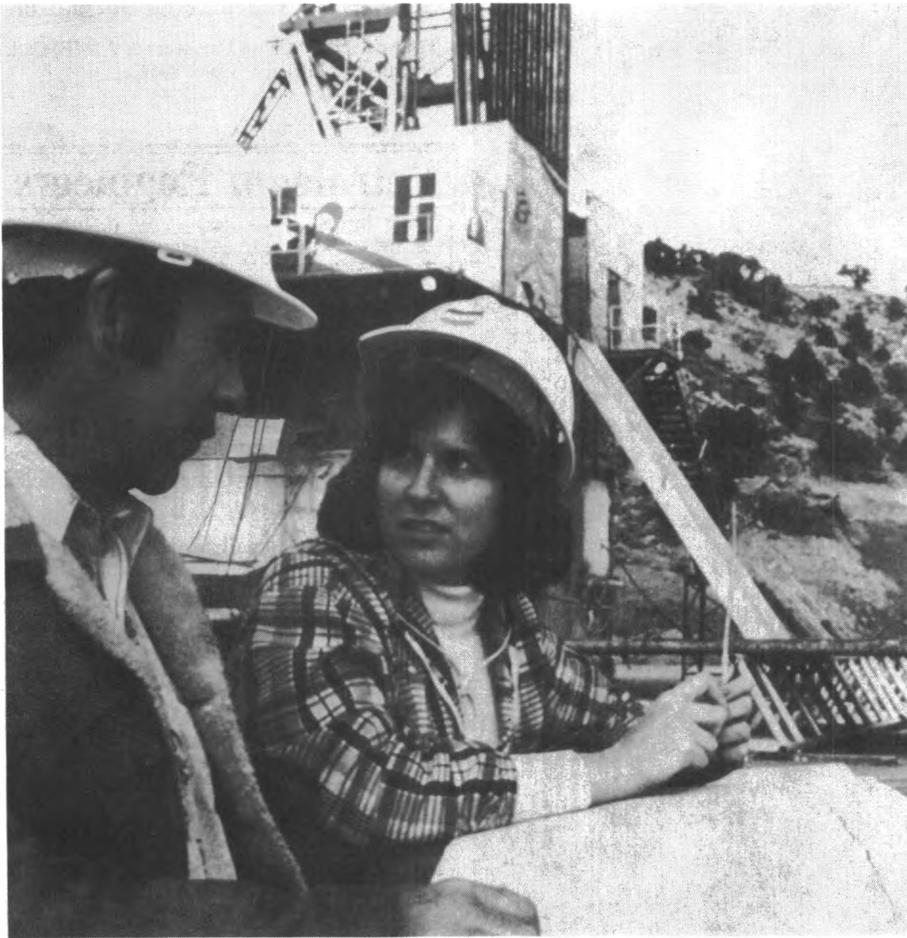
Places of Employment

About 17,000 petroleum engineers were employed in 1978, 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 and production 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 the oil-producing States of Texas, Oklahoma, Louisiana, and California. There are many American petroleum engineers working overseas in oil-producing countries.

Employment Outlook

The employment of petroleum engineers is expected to grow faster than the average for all occupations through the 1980's. Economic expansion will require 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



Petroleum engineers evaluating the oil and gas potential of a newly drilled well.

sophisticated and expensive recovery methods will be used. New sources of oil, such as oil shale and new offshore oil sources, may be developed. Also, new drilling techniques will be needed in developing geothermal energy. All of these factors will contribute to increasing demand for petroleum engineers. (See introductory part of this section for information on training requirements and earnings.)

Sources of Additional Information

Society of Petroleum Engineers of AIME,
6200 North Central Expressway, Dallas, Tex.
75206.

Environmental Scientists

Environmental scientists help us understand our natural environment—the earth, its atmosphere, and the oceans. These scientists, sometimes known as earth scientists, are concerned with the history, composition, and characteristics of the earth's surface, interior, and atmosphere. Some do basic research to increase scientific knowledge, while others apply the knowledge gained from basic research to practical problems. Geologists, for example, may explore for new sources of oil and other minerals, while many meteorologists forecast the weather. Environmental scientists also play an important role in solving environmental pollution problems. Many environmental scientists teach in colleges and universities.

This chapter discusses four environmental science occupations—geologists, geophysicists, meteorologists, and oceanographers.

Geologists

(D.O.T. 024.061 -018, -022, -038, -042, -046, and 054)

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 result in significant advances, such as the ability to predict earthquakes. 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 micro-



Geologist collects rock samples at the edge of an open-pit mine.

scope, 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. *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. *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 statements on oceanographers and mining elsewhere in the *Handbook*.)

Working Conditions

Conditions of work vary. Exploration geologists often work overseas. 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. When not working outdoors, geologists are in comfortable, well-lighted, well-ventilated offices and laboratories.

Places of Employment

About 31,000 people worked as geologists in 1978. More than three-fifths of all geologists work in private industry. Most industrial geologists work for petroleum companies; geologists also work for mining and quarrying companies. (See the statements on the mining and petroleum industries elsewhere in the *Handbook*.) Some are employed by construction firms. Others are independent consultants to industry and government.

The Federal Government employed over 2,000 geologists in 1978. Two-thirds worked for the Department of the Interior in the U.S. Geological Survey, the Bureau of Mines, and the Bureau of Reclamation. State agencies also employ geologists, some working on surveys in cooperation with the U.S. Geological Survey.

Colleges and universities employed about 10,400 geologists. Some worked for nonprofit research institutions and museums.

Employment of geologists is concentrated in those States with large oil and mineral deposits. Almost two-thirds work in five States: Texas, California, Louisiana, Colorado, and Oklahoma. 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.

About 350 colleges and universities offer a bachelor's degree in geology. Undergraduate students devote about one-fourth of their time to geology courses, including physical, structural, and historical geology, mineralogy, petrology, and invertebrate paleontology; about one-third of their time to courses in mathematics, related sciences—such as physics and chemistry—and engineering; and the remainder to general academic subjects.

More than 150 universities award advanced degrees in geology. Graduate students take advanced courses in geology and specialize in one branch of the science.

Students planning careers in exploration geology should like the outdoors and 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.

Employment 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. This growth will create many new openings each year. Many additional openings will be created each year by geologists who retire, die, or leave the occupation.

Increased prices for petroleum and the necessity to locate new sources of minerals, as older sources become exhausted, will stimulate domestic exploration activities and require many additional geologists. Additional geologists also will be needed to discover new resources and their potential uses. For example, geologists will help determine 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.

Earnings

Geologists have relatively high salaries, with average earnings over twice those of nonsupervisory workers in private industry, except farming.

According to a survey done by the College Placement Council in early 1979, graduates with bachelor's degrees in other physical and earth sciences received average starting offers of \$15,400 a year. Graduates with master's degrees in geology and related geological sciences received average starting offers of \$19,000 per year.

In the Federal Government in 1979, geologists having a bachelor's degree could begin at \$10,507 or \$13,014 a year, depending on their college records. Those having a master's degree could start at \$13,014 or \$15,920 a year; those having the Ph. D. degree, at \$19,263 or \$23,087. In 1978, the average salary for geologists employed in the Federal Government was about \$26,500 a year.

Related Occupations

Over one-half of all nonacademic 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, 5205 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.

Geophysicists

(D.O.T. 024.061-030)

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.

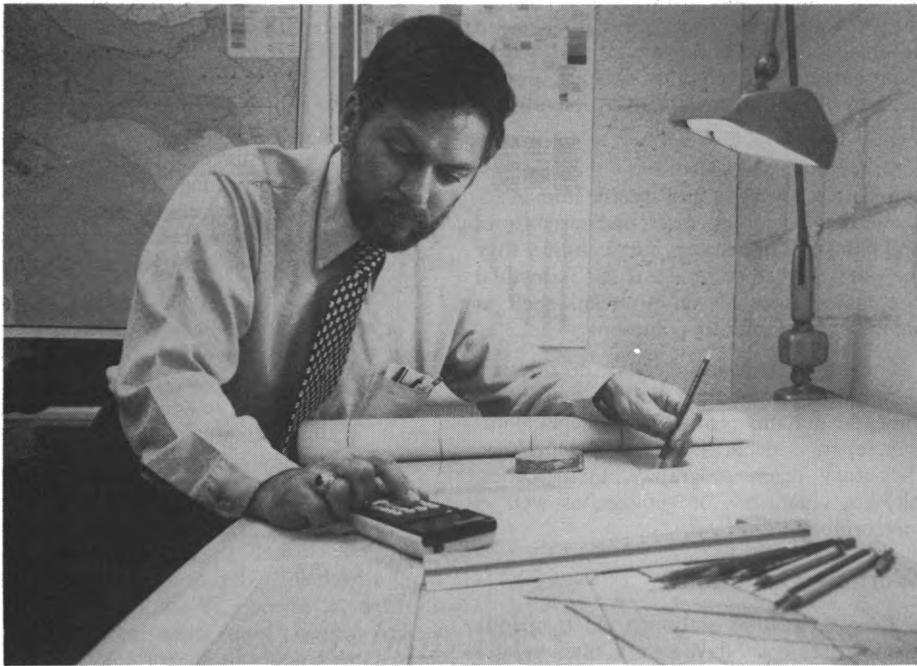
Geophysicists usually specialize in 1 of 3 general phases of the science—solid earth, fluid earth, and upper atmosphere. Some may also study other planets.

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 the earth's interior and vibrations caused by earthquakes and man-made explosions. They explore for oil and minerals, study how to detect 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 also may study rainfall, its rate of infiltration into soil, and its return to the ocean. Some are concerned with water supplies, irrigation, flood control, and soil erosion. (See the statement on oceanographers, sometimes classi-



Geophysicist analyzes data obtained from earlier studies.

fied 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*.)

Working Conditions

Many geophysicists work outdoors and travel for extended periods of time. Some work at research stations in remote areas, or aboard ships and aircraft equipped with sophisticated geophysical equipment. When not in the field, geophysicists work in modern, well-equipped, well-lighted laboratories and offices.

Places of Employment

About 11,000 people worked as geophysicists in 1978. Most work in private industry, chiefly for petroleum and natural gas companies. (See the chapter on the mining and petroleum industry elsewhere in the *Handbook*.) 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.

Geophysicists are employed in many southwestern and western States, and on the

Gulf Coast, where large oil and natural gas fields are located. Some geophysicists are employed by American firms overseas for varying periods of time.

Over 2,500 geophysicists, geodesists, and hydrologists worked for Federal Government agencies in 1978, mainly the U.S. Geological Survey, the National Oceanic and Atmospheric Administration (NOAA), and the Defense Department. 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 40 colleges and universities award the bachelor's degree in geophysics. Other programs offering training for beginning geophysicists include geophysical technology, geophysical engineering, engineering geology, petroleum geology, and geodesy.

About 30 universities grant the master's and Ph. D. degree in geophysics. Candidates with a bachelor's degree which includes courses in geology, mathematics, physics, engineering, or a combination of these subjects can be admitted.

Geophysicists often work as part of a team. They should be curious, analytical, and able to communicate effectively.

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.

Employment Outlook

Employment opportunities are expected to be very good for graduates with a degree in geophysics or a related field. Although few openings are expected in this relatively small field, the number of qualified people may fall short of requirements if the present trend in the number obtaining geophysics training continues.

Employment of geophysicists is expected to grow faster than the average for all occupations through the 1980's. As known deposits of petroleum and other minerals are depleted, petroleum and mining companies will need increasing numbers of geophysicists who can use sophisticated electronic techniques to find less accessible fuel and mineral deposits.

In addition, geophysicists with advanced training will be needed to do research on radioactivity and cosmic and solar radiation and to investigate the use of geothermal power (steam from the earth's interior) as a source of energy to generate electricity.

Federal agencies are expected to hire more geophysicists for new and expanding programs. Through the 1980's, jobs will depend heavily on funds for research and development in earth sciences as the Government supports energy research in both established and alternative sources. The Government also may fund research to locate more natural resources and to prevent environmental damage through better land use.

Earnings

Geophysicists have relatively high salaries, with average earnings more than twice those of nonsupervisory workers in private industry, except farming.

According to a survey done by the College Placement Council in early 1979, graduates with bachelor's degrees in other physical and earth sciences received average starting offers of \$15,400 a year. Graduates with master's degrees in geology and related geological sciences received average starting offers of \$19,000 per year.

In the Federal Government in 1979, geophysicists having a bachelor's degree could begin at \$10,507 or \$13,014 a year, depending on their college records. Geophysicists having a master's degree could start at \$13,014 or \$15,920 a year; those having a Ph. D. degree, at \$19,263 or \$23,087. In 1978, the average salary for geophysicists employed by

the Federal Government was about \$27,600 a year.

Related Occupations

Geophysicists investigate and use basic scientific principles about 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, training, and earnings 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 physical environment. The best known application of this knowledge is in understanding and forecasting the weather. Meteorological research also is applied in many other areas not directly related to weather forecasting such as understanding and solving air pollution problems and studying trends in the earth's climate.

Meteorologists who specialize in forecasting the weather, known professionally as *synoptic 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, rain,

fall, 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.

Other meteorologists study the relationship between weather and specific human activities, biological processes, and agricultural and industrial operations. For example, they may make weather forecasts for individual companies, or work on problems such as smoke control and air pollution.

Some meteorologists teach or do research—frequently combining both activities—in colleges and universities. In colleges without separate departments of meteorology, they may teach 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 nightwork and rotating shifts. Most stations are at airports or in or near cities; some are in isolated and remote areas. Meteorologists in smaller weather stations generally work alone; in larger ones, they work as part of a team.

Places of Employment

About 7,300 persons worked as meteorologists in 1978. 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 over 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 over 200 civilian meteorologists.

Over 3,000 meteorologists worked for private industry. Commercial airlines employed several hundred to forecast weather along flight routes and to brief pilots on atmospheric conditions. Others worked for private weather consulting firms, for companies that design and manufacture meteorological instruments, and for firms in aerospace, insurance, engineering, utilities, radio and television, and other industries.

Colleges and universities employed over 1,300 meteorologists in research and teaching. A few worked for State and local governments and for nonprofit organizations.

Although meteorologists are employed in all parts of the country, almost one-seventh work in the Washington, D.C., area.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in meteorology is the usual minimum requirement for beginning jobs in weather forecast-

ing. 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 1978, 36 colleges and universities offered a bachelor's degree in meteorology or atmospheric science; 39 schools offered advanced degrees. Many other institutions offered some courses in meteorology.

The Armed Forces give and support meteorological training, both undergraduate education for enlisted personnel and advanced study for officers.

NOAA has a program under which some of its meteorologists attend college for advanced or specialized training. College students can obtain summer jobs with this agency or enroll in its cooperative education program in which they work at NOAA part of the year and attend school part of the year. In addition to helping students finance their education, this program gives them experience valuable for finding a job when they graduate.

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.

Employment Outlook

Meteorologists with advanced degrees in meteorology are expected to have favorable job opportunities through the 1980's. Persons without an advanced degree are expected to face some competition for jobs.

Employment in this small field, as a whole, is expected to increase about as fast as the average for all occupations. Employment of meteorologists is expected to grow as private industry realizes their importance in understanding and preventing air pollution. Many companies also recognize the value of having their own weather forecasting and meteorological services. Openings should develop in radio and television as stations increasingly rely on their own meteorologists for weather reports. Colleges and universities will offer some job opportunities, especially for those



Commercial airlines employ meteorologists to forecast weather along flight routes.

with advanced degrees. The Federal Government is not expected to increase its employment of civilian meteorologists significantly, although there will be openings created by replacement needs.

Earnings

Meteorologists have relatively high earnings; their salaries are about twice the average for nonsupervisory workers in private industry, except farming.

In 1979, meteorologists in the Federal Government with a bachelor's degree and no experience received starting salaries of \$10,507 or \$13,014 a year, depending on their college grades. Those with a master's degree could start at \$13,014 or \$15,920, and those with the Ph. D. degree at \$19,263 or \$23,087. The average salary for meteorologists employed by the Federal Government was \$27,600 in 1978.

In 1978, beginning meteorologists with commercial airlines earned between \$17,000 and \$25,000 a year, while experienced airline meteorologists earned between \$25,000 and \$31,000 a year. (See the statement on occupations in civil aviation 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

General information on career opportunities in meteorology is available from:

American Meteorological Society, 45 Beacon St., Boston, Mass. 02108.

<http://fraser.stlouisfed.org/>

Federal Reserve Bank of St. Louis

American Geophysical Union, 2000 Florida Ave. NW., Washington, D.C. 20009.

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 (float-

ing 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 oceanographers* (marine biologists) 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* (physicists and geophysicists) 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* (marine geologists) 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*.

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



Oceanographers use specialized instruments in their studies.

craft, and other equipment to work under water.

Places of Employment

About 3,600 persons worked as oceanographers in 1978. Over one-half worked in colleges and universities, and about one-fifth 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. Nearly one-fifth of all oceanographers work in the Washington, D.C., metropolitan area.

Training, Other Qualifications, and Advancement

The minimum requirement for beginning professional jobs in oceanography is a bachelor's degree with a major in oceanography, biology, earth or physical sciences, mathematics, or engineering. However, most other jobs in research and teaching require graduate training in oceanography or a basic science. For many high-level positions a doctoral degree is preferred, and sometimes required.

About 65 colleges and universities offered undergraduate degrees in oceanography or marine sciences in 1978. However, undergraduate training in a basic science and a strong interest in oceanography may be adequate preparation for some beginning jobs and is the preferred 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, students 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 1978, about 55 colleges offered advanced degrees in oceanography and marine sciences. In graduate schools, students take advanced courses in oceanography and in basic sciences.

Graduate students 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.

Employment Outlook

Persons seeking jobs in oceanography may face competition through the 1980's. Those with a Ph. D. degree should have the best opportunities; those with less education may find limited opportunities as research assistants or technicians; and those who combine a scientific background with oceanography should have better prospects than others whose knowledge is limited to oceanography.

Employment of oceanographers is expected to grow about as fast as the average for all occupations as awareness increases of the need for ocean research to understand and control pollution and to recover offshore oil and other resources. However, this small field may not grow fast enough to create openings for all those expected to seek entry. Since the Federal Government finances most oceanographic research, a large increase in Federal spending in oceanography could improve employment prospects.

Earnings

The salaries of oceanographers were more than twice the average received by nonsupervisory workers in private industry, except farming.

In 1979, oceanographers in the Federal Government with a bachelor's degree received starting salaries of \$10,507 or \$13,014 a year, depending on their college grades. Those with a master's degree could start at \$15,920 or \$19,263; and those with a Ph. D. degree at \$19,263 or \$23,087. The average salary for experienced oceanographers in the Federal Government in 1978 was about \$25,900 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 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, 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, Washing-

ton Area Office, 1900 E St. NW., Washington,
D.C. 20415.

The booklet, *Training and Careers in Marine Science*, is available for 50 cents 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.)

Life Science Occupations

Life scientists study living organisms and their life processes. They are concerned with the origin and preservation of life, from the largest animal to the smallest living cell. The variety of plants and animals is so large, and their processes so varied and complex, that life scientists usually work in one of the three broad areas—agriculture, biology, or medicine. Biochemists—those who study the chemistry of life—and soil scientists also are considered life scientists.

Life scientists teach, perform basic research to expand knowledge of living things, and apply knowledge gained from research to the solution of practical problems. New drugs, special varieties of plants, and a cleaner environment result from the work of life scientists.

This chapter discusses life scientists who work in the areas of agriculture, biology, or medicine. It also contains separate statements on biochemists and soil scientists.

Biochemists

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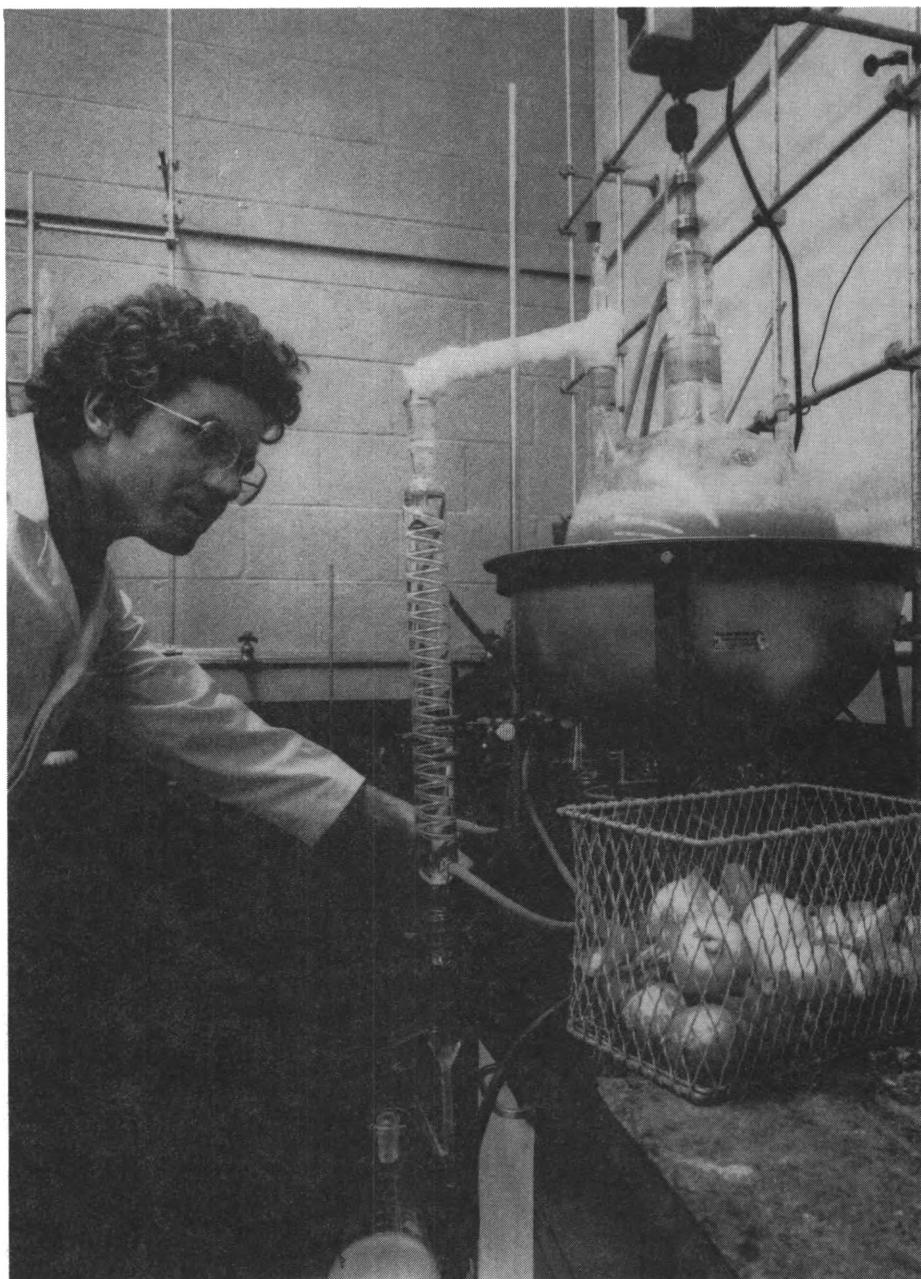
Nature of the Work

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, knowledge of how an organism forms a hormone is used to synthesize and produce hormones on a mass scale.

Laboratory research involves weighing, fil-



Most biochemists work in basic or applied research.

tering, 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 may travel occasionally to attend meetings and conferences. Biochemists' laboratory work usually is not dangerous or unhealthy, if the proper procedures are observed.