EMPLOYMENT OUTLOOK IN
THE BUILDING TRADES

UNITED STATES DEPARTMENT OF LABOR • BUREAU OF LABOR STATISTICS
MAURICE J. TOBIN, *Secretary* EWAN CLAGUE, *Commissioner*
IN COOPERATION WITH VETERANS ADMINISTRATION

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Letter of Transmittal

UNITED STATES DEPARTMENT OF LABOR,
BUREAU OF LABOR STATISTICS,
Washington, D. C., July 20, 1949.

The SECRETARY OF LABOR:

I have the honor to transmit herewith a report on the employment outlook in the building trades. This is one of a series of occupational studies conducted in the Bureau's Occupational Outlook Branch for use in vocational counseling of veterans, young people in schools, and others interested in choosing a field of work. The study was financed largely by the Veterans Administration, and the report was originally published as Veterans Administration Pamphlet 7–4.11 for use in vocational rehabilitation and education activities.

The study was prepared by Alexander C. Findlay, who was assisted in the preparation of Part 3 by Ruth Gordon. The Bureau wishes to acknowledge the generous assistance received from the international unions making up the Building Trades Department of the American Federation of Labor, from associations of contractors, from architectural and building magazines, and from others.

EWAN CLAGUE, *Commissioner.*

Hon. MAURICE J. TOBIN,
Secretary of Labor.

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SUMMARY

Prospects for workers in the skilled building trades are excellent for the next few years and, on a long-range basis are very good. Exceptions are the trades of painter, paperhanger, and boilermaker; for stonemasons the outlook is fair, and for tile setters it is uncertain; for laborers it is not as good as for most of the skilled trades. There is a very large backlog of work to be done and, although the current rate of new construction activity is by far the highest in the country's history as measured in dollar expenditures, in physical volume it is well below the rate during several of the predepression years.

Construction employment is strongly dependent on general business conditions and has been marked in the past by great reduction when general employment falls. Complete stability cannot be expected, but it seems unlikely that such a disastrous drop as that from 1928 to 1933 will be repeated in its full intensity.

All trades are affected to at least some degree —and some trades to a serious degree—by seasonal unemployment resulting from weather and other causes. Some degree of improvement seems likely, but year-round employment for most building workers is at best a hope for the distant future rather than an expectation for the near future.

The building trades are lifetime occupations, from two standpoints: They will continue to offer employment opportunities for a long time to come; and a workman can keep his skill and continue to find employment at a greater age than in many other industries. All trades have changed within the past generation, some of them quite markedly, and most are in process of change at the present moment, but the necessary adjustments have presented few serious difficulties to those already in the trades. In the future there is likely to be more complete processing and fabrication of materials before delivery and more complete mechanization of work at the construction site, but each will be a continuation of a long-time trend rather than a new development. There is no risk that building workers will be supplanted by magical new methods, even though factory assemblies may reduce site labor requirements greatly for certain quite specific types of buildings; these types are not a large enough part of the total market to constitute a real threat.

As in all occupations, there are jobs where young workers are preferred; but there are also jobs where older workers are regarded as fully equal, if not superior. In many jobs, particularly remodeling and repair work, it is far more important that a workman understand completely what he is doing and be able to recognize and deal with any condition that he may encounter, than that he have the speed and endurance of youth.

With respect to its labor force, the construction industry is outstanding in being an industry of journeymen; it is by far the largest industry in which this is the case. The skilled building trades make up the Nation's largest group of related skilled occupations — about three times as many as workers in the skilled machine-shop occupations, about eight times as many as in operation of railroad trains, about two and one-half times as many as in printing and publishing. Semiskilled workers are much less important, in building construction particularly; except for truck drivers, most of them perform services for the journeymen, and few of them take part in the journeymen's activity of using tools and installing materials. Unskilled workers (laborers) will continue to be needed permanently, as far as can now be seen, although their place has been reduced progressively by mechanization and further mechanization of unskilled operations seems virtually certain.

Journeymen have high hourly earnings and, during normal economic conditions, fairly high although seasonally irregular annual earnings. Status as a journeyman carries prestige; it means membership in a group universally recognized for skill and competence in a basic part of the country's economic life. It is an asset for employment in any part of the country and, for

the larger trades, in communities of any size. The work is satisfying, offering variety and opportunity to see the results of the work being done, in contrast to repetition and close specialization found in many other occupations. Journeyman status confers a greater degree of independence than that of most other occupations. A journeyman depends on his competence in the trade and on general economic conditions, rather than on either the fortunes or the good will of any particular employer; and he can change to another employer without penalty. His opportunity to establish his own business is greater than for the man in almost any factory occupation. While most such businesses are fairly small, they afford opportunity for expansion and many large contracting firms have been started and operated by former journeymen. For several contracting fields competition from persons with other backgrounds is keener than in the past, but the opportunities remain good for those with the appropriate combination of abilities.

The prinicpal disadvantage of building work has been its extreme variation with general business conditions, so that a reduction in total nonagricultural employment or national income has been accompanied by a much greater reduction in construction employment. Less serious, but far from negligible in importance for the majority of workers, is seasonal lost time, even during comparatively good years. They must pay their yearly expenses from high earnings for about 8 or 9 months plus much lower earnings for the remaining months. Several weeks of continuous unemployment in winter is by no means uncommon, even in good years. Unemployment compensation benefits are, of course, much below full-time earnings.

Construction occurs everywhere, and even on quite specialized jobs or those performed by contractors from distant cities, local workers are hired as far as possible. This means that employment opportunities will be present everywhere. The number of workers to be hired at any time will necessarily be greatest where the greatest amount of construction is going on—for the most part, the largest cities. That does not necessarily mean that employment opportunities are greatest in such cities, however, because in each case the local construction labor force is also largest there. Employment prospects in different localities can be stated in general terms only, and such statements are given in a later section of this bulletin. In general, employment prospects are best in those parts of the country now in an active stage of industrial development and population growth. Even in the economically mature parts of the country, where construction activity seems unlikely to make up as large a part of the national total as in the past, new workers will be needed almost continuously to replace those leaving the labor force because of death or retirement. Furthermore, men in the construction trades find it much easier to move from place to place than do workers in many other occupations. A young man having an opportunity for apprenticeship in a trade which interests him should not be guided solely or even primarily by his opinion of construction prospects in his home locality. Skills learned through apprenticeship there will be applicable in employment anywhere else he may go.

Requirements for those wishing to enter a trade are good health, average intelligence, a fairly good education (completion of high school is advantageous but in some cases is not required), willingness to learn, at least average strength, and some manual dexterity. Adeptness and enjoyment in the use of tools are highly desirable, but for most of the trades an interest in the principles and in how and why the parts fit together is fully as important, if not more so.

PART I

CONSTRUCTION: CHARACTERISTICS OF THE INDUSTRY AND ITS EMPLOYMENT

Major Types of Employment

The Fields of Employment

Construction workers work in the contract construction industry (described on page 4), in force-account construction and maintenance, and as self-employed workers. In addition, some of them are employed on jobs having no direct connection with construction but using the skills of a construction trade. There is almost complete fluidity between these fields, so that a journeyman employed by a contractor at one time may be employed a few weeks later by a manufacturing firm to work on remodeling its plant office, or may be conducting a small business of his own as a self-employed workman.

The largest single field is the *contract construction industry,* for which average monthly employment was a little over 2 million during 1948, with a monthly range from 1,731,000 to 2,253,000. From January 1939 through December 1948 monthly employment ranged from 904,000 to 2,577,000.[1] A workman's employment in this industry is related to a given type of work rather than to any individual contractor, or even to any particular type of contractor. Thus, carpenters are employed mainly by builders and general building contractors, but any individual carpenter may in the course of a year be employed by a highway contractor to build forms for a concrete bridge, by an electrical or plumbing contractor to build a temporary job office and tool shed at the site where a large building is being put up, and by a carpentry contractor for the framing and rough carpentry on a church, as well as by one or more builders or general building contractors. Similarly a painter would ordinarily be employed by a painting contractor but might be employed by a general building contractor having his own painting crew, or by a general building contractor to paint a job office or even some of his construction machinery. The contractor designates the work to be done; plans the sequence of operations at least broadly, either in person or through a superintendent or foreman; supplies the materials as needed; supplies any machinery, equipment, and special tools that are needed; and assumes full responsibility for the financial outcome of his part of the total construction work (which may be the entire structure, or may be a single part of the job such as painting or electrical wiring). The contractor also is responsible for acceptability of the completed work to the owner or architect and to the building inspector and other appropriate public officials. A journeyman's responsibility is for competent performance of the work assigned to him and for notifying the foreman or contractor of any unsatisfactory conditions affecting his work, such as errors in related work of other trades.

Force-account employment, although smaller, is an important employment field. Here the employer is a business establishment or government body performing construction work for its own use, instead of engaging a contractor to handle it. In the field of new construction this is commonest for paving, although it is also used to some degree for all other types, including building. New construction projects carried out by force account can be very large, but usually are of moderate or small size because of the disavantages of forming and later dissolving large organizations for infrequent jobs of unusual size. The characteristics of such employment on new construction are essentially the same as those of employment by contractors on projects of the same type. Force-account work is more common, however, for maintenance, repairs, and minor alterations.

[1] These figures include other employees as well as members of the skilled trades.

Industrial plants, hotels, owners of office buildings and large apartment buildings, boards of education, State and county highway commissions, city water departments, organizations of all types employ workers directly to maintain and repair their property, to do remodeling as necessary, and to make minor improvements. Employment here is frequently on a year-round basis with wages often at a weekly or monthly rather than an hourly rate. Unless the property involved is very large there is very likely to be less specialization than in new work, so that a workman is often hired on the basis of doing all work within his own trade plus the commoner jobs in related trades. In some cases there is a combination of building work and shop work. Thus a maintenance painter in a hotel might refinish marred furniture as occasion arose, as well as doing painting, paperhanging and other decorating in the guest rooms, corridors, and other parts of the building.

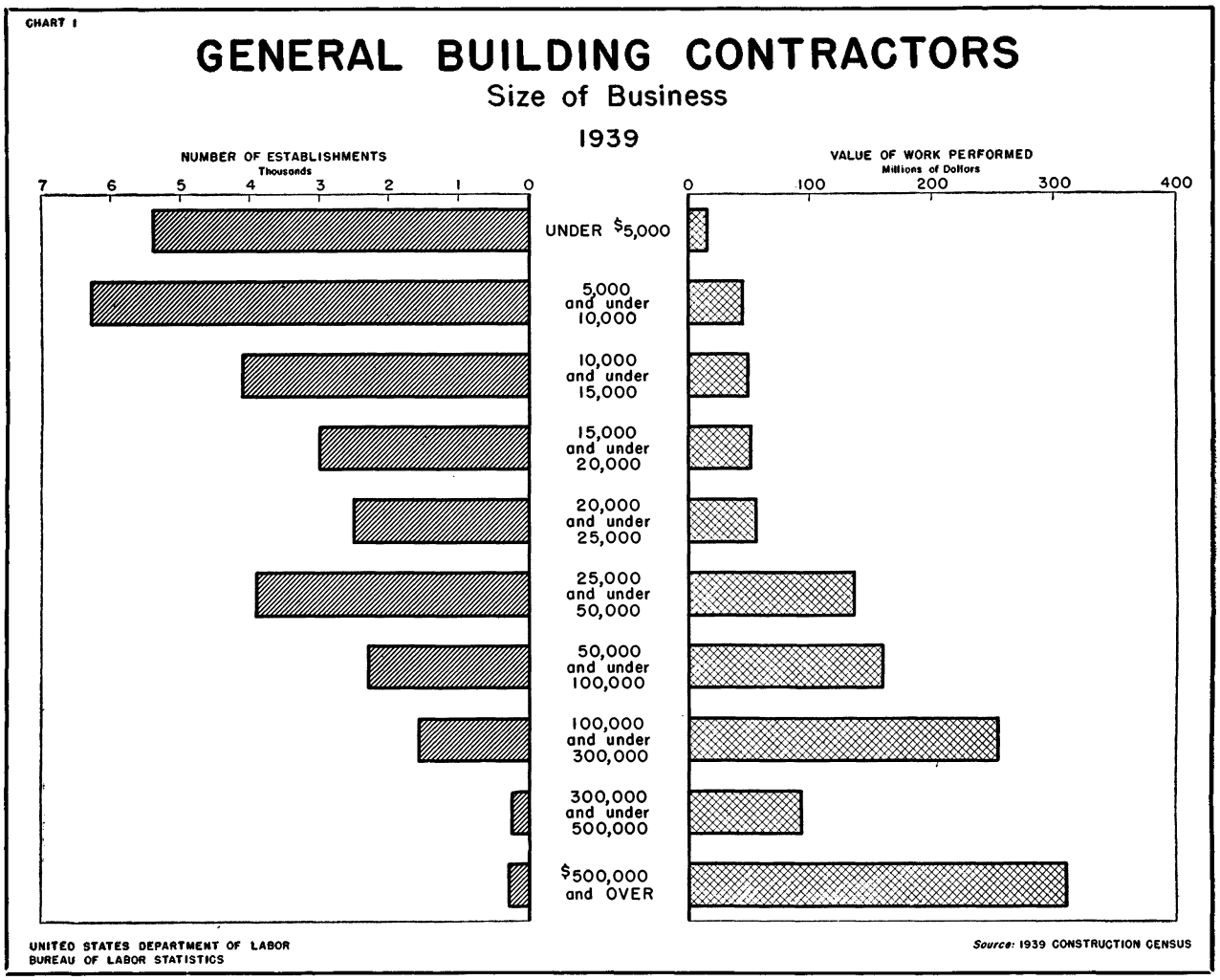
Self-employment is the third large field. A self-employed workman is hired directly by a series of property owners or their agents for specific jobs. This has some of the characteristics of wage employment, and, in other respects, it resembles contracting. It is limited to small jobs, in which the workman can do most if not all of the work himself; he may hire one or two men to work for him occasionally, but not regularly, and, in any case, works with the tools of his trade. He may be paid by the job and may include materials in an over-all price, or the materials may be provided by the owner; in other cases, he is paid by the hour or day. In any case he does not sublet work to others —if the job includes work which he cannot do (such as plastering or electrical work in small alterations consisting mainly of carpentry) the owner arranges for this directly. A self-employed workman resembles a contractor in taking responsibility for completion of the job, in planning the way in which it is to be done, in providing any equipment needed as well as hand tools, and (in most cases) in scheduling and ordering the materials needed even though the material bills may be paid directly by the owner. He resembles a wage employee in that his income is derived mainly from his own direct work.

Self-employment is commonest in those fields having a large volume of maintenance, repair, and small alteration jobs—particularly painting and decorating and carpentry. It is present in other trades also but is less common than it would otherwise be in the trades for which a State or municipal license is commonly required (especially plumbing and electrical work). It is, of course, completely impractical for any type of work needing expensive machinery or shop equipment. Self-employment is probably as common as ever for painting and decorating. For carpentry, however, it has met keen competition in many areas from home improvement establishments which seek small jobs of all sorts by active sales efforts, often with a sales room containing displays of the types of work they offer.

The remaining employment field is much smaller and differs in extent among the trades; it consists of nonconstruction employment, in factories and elsewhere, using the skills of one of the construction trades. Men so employed are journeymen in the full sense of the term and are not to be confused with semiskilled workers performing repetitive work on the same materials. Thus sheet metal workers are employed in making enclosures and other parts for custom-built machinery, and in making full-size, nonoperating models (mock-ups) of new devices to show their exact appearance before quantity manufacture is started. Examples in carpentry are the making of similar "mock-ups" in wood, the building of displays of various types for window or other use, building of work tables and wooden templates, etc. Plumbers, pipefitters, and electricians are employed extensively in shipbuilding. Boilermakers are employed only partially in construction; their past employment has been mainly in factory manufacture of boilers and tanks, in shipbuilding, and in repair and rebuilding of locomotive and marine boilers. The importance of this nonconstruction employment differs among the trades, ranging from the major part of all employment for boilermakers to negligible amounts for several of the trades.

The Contract Construction Industry

In its organizational form, the contract construction industry is unique among American industries. This form has developed from the

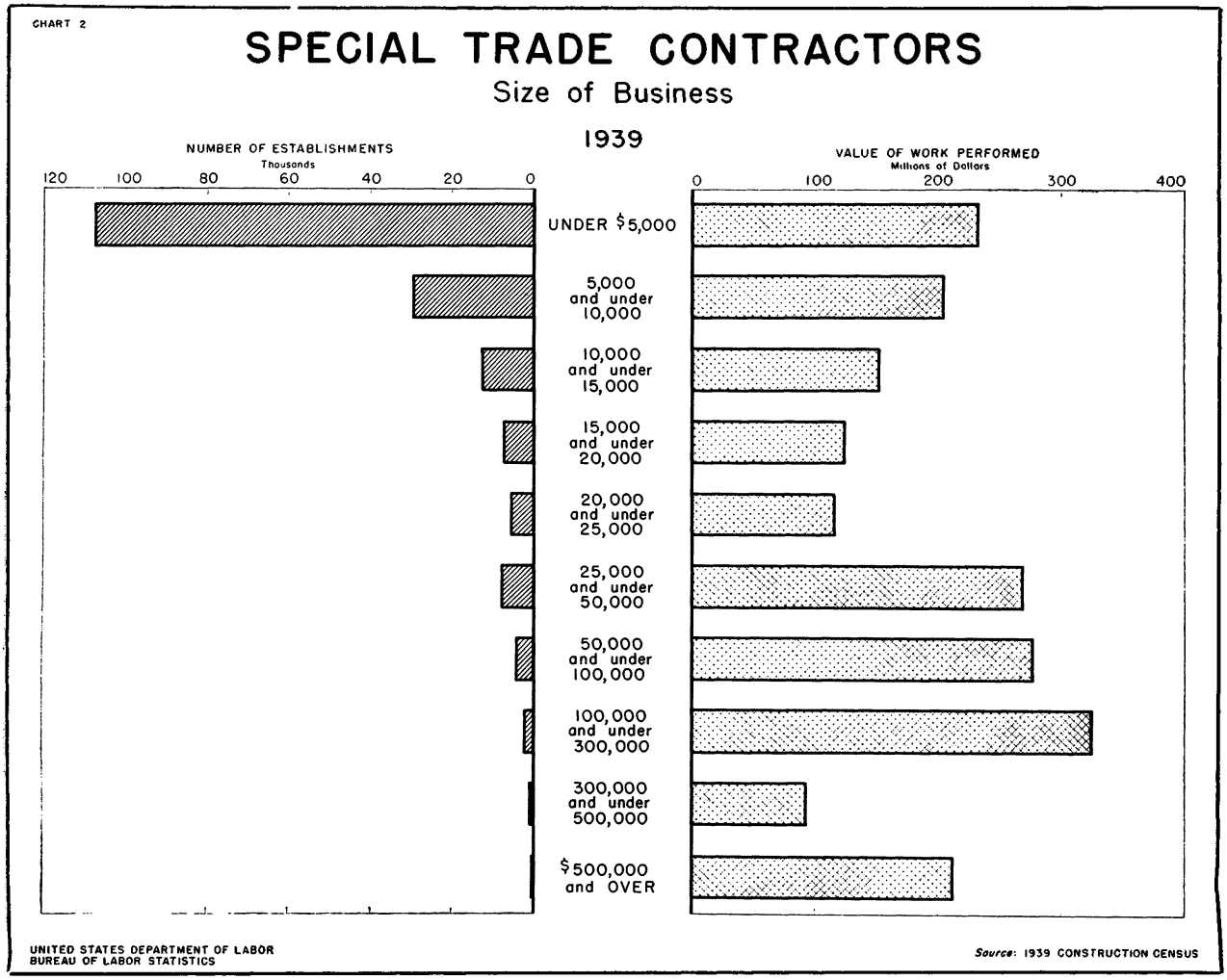


tremendous variety in its product, with consequent need for great flexibility, which in turn is provided by specialization. For most types of construction several contractors work jointly, each doing the kinds of work for which he is especially fitted.

The industry is usually classified into three groups of firms: Builders, general contractors, and special trade contractors. *Builders* operate on their own account, putting up houses; in some cases, apartment buildings; occasionally, stores or other nonresidential buildings. The houses are ordinarily built for sale, and the other buildings may be intended either for sale or for ownership and rental.[2] The builders decide on the characteristics of their projects; obtain designs; buy land; arrange financing; arrange for site improvements, such as water lines, sewer lines, and street paving; and in the building operations proper do the work corresponding to that of general contractors as described below.

The term "contractor" refers to a firm performing construction work authorized by others, rather than work undertaken on its own initiative. The form of authorization differs widely and is not limited to a written agreement to build a structure described in more or less detail by drawings and specifications at a stipulated price. There are numerous other types of written agreements, and in some cases the authorization is verbal only. But decision to proceed, selection of land, obtaining of individual or stock architectural drawings, arrangement of financing and other matters

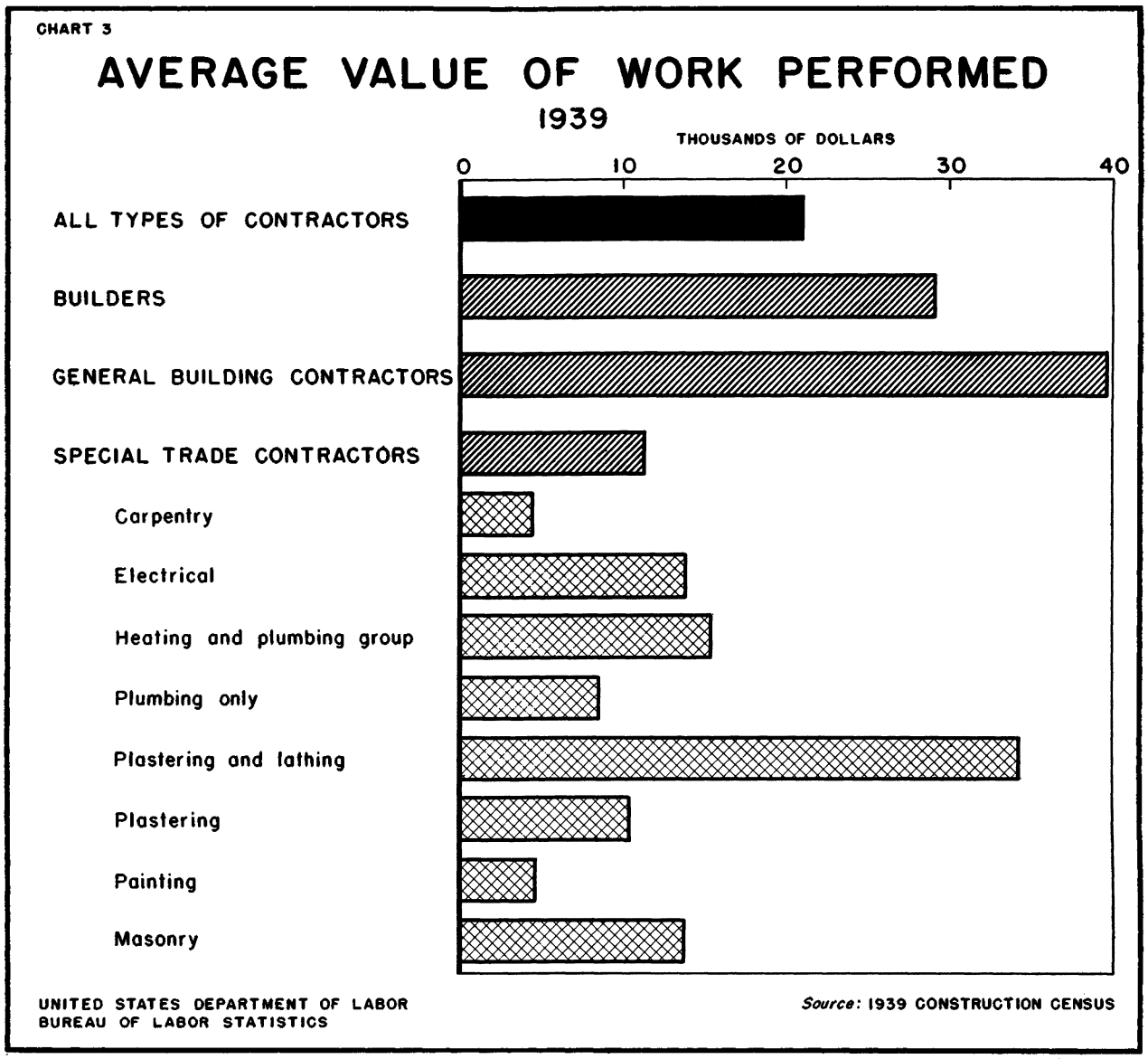
[2] Persons and organizations performing construction for their own use are not regarded as part of the construction industry even though they buy materials, hire workmen, and direct the work.



separate from the construction operations themselves are the responsibility of the owner, and any advice or assistance which the contractor may give is outside of his basic function of carrying out the construction operations.

General contractors construct buildings and other structures and do alteration and repair work, on contract for owners. They take responsibility for the entire job, except that in some cases certain parts of the work are omitted from the general contract and arranged separately by the owner or architect. Standard practice is that general contractors carry out the major part of each project with their own forces and sublet the remainder to other contractors (special trade contractors), but usage with respect to the amount and kinds of work sublet differs greatly. There are three types of general contractors, based on the type of construction which they undertake: Building; highway, which includes other forms of paving such as city streets or airport landing strips; and heavy, which includes all other important forms of nonbuilding construction (dams, piers, sewer or water lines, dredging, tunnels, many other forms).

Special trade contractors carry out the work of a single trade or two or more closely related trades—painting, electrical work, plumbing with or without steam and hot water heating, sheet metal work with or without roofing, etc. Much of this work is done for builders or general contractors, while other jobs (most repair jobs, and some new jobs as well) are done directly for the owners. There is also secondary subcontracting, as when a plastering contractor receives a subcontract for plastering and lathing and sublets the lathing to a lathing contractor.



Ordinarily a contractor provides as well as installs all materials for his part of the project, but not uncommonly specified materials are provided for him by others, if the owner or general contractor has particularly favorable buying arrangements for certain items. The extreme case is "labor only" contracting, in which the person or firm awarding the contract provides all materials. This can be bona fide contracting, with the contractor operating an established permanent business and having the customary employer relationship to his workers. As such, it is found mainly in some of the specialized fields—setting of reenforcing steel or cut stone for general contractors, installation of numerous specialities in the ornamental metal field where a manufacturer's representative obtains an over-all contract but sublets installation to a local ornamental iron contractor, etc. This is entirely distinct from "labor only" subcontracting as a disguised form of piecework employment, described briefly on page 24.

The 1939 census of construction, reports 215,050 firms in the construction industry—3,705 builders, 29,641 general building contractors, 5,517 other general contractors, and 176,187 special trade contractors. Most of these were small. Well over half of the builders, about two-thirds of the general building contractors, and more than eleven-twelfths of the special

trade contractors performed work valued at less than $25,000 during the year.[3] In fact, almost a fifth of the general building contractors and three-fifths of the special trade contractors performed work valued at $5,000 or less. At the opposite extreme were a few large firms performing work valued at $500,000 or over. There were only 296 building contractors in this group, but their work performed was over $310,000,000, or more than a quarter of the work performed by all building contractors. Of the special trade contractors only 163 were in this class, but the value of work which they performed ($213,000,000) was nine-tenths as great as that of the 107,620 special trade contractors performing work valued under $5,000 ($233,000,000).

Long-Range Outlook for the Building Trades

For a young man considering apprenticeship, what is the risk that the building trade he chooses will become obsolete, leaving him with training and ability for which there is no employment market? This danger is so slight that it can be ignored, although long-range prospects are not equally good for all trades. The employment field for boilermakers has been declining because of developments entirely outside of the construction industry; long-range prospects for painters are for a quite large volume of employment, although smaller in proportion to total employment than in the past; but obsolescence is scarcely a risk to be considered seriously.

Two questions arise in evaluating the outlook for the construction trades: What will be the effect of new designs, new methods, and factory assemblies on site construction work as a whole? and, what will be the effect of these, plus new materials, on individual trades?

Factory assembly is by no means a new development but has been in progress for well over a hundred years at least. An early scene in George Eliot's novel "Adam Bede" shows the making of doors and other millwork for a house by the same carpenters who would later install them. This procedure was standard until the introduction of power woodworking machinery, followed by factory manufacture of millwork. Within recent years particularly, factory processing has become more complete so that a smaller part of the total work occurs at the site. This trend will probably continue but will mean a gradual change just as it has in the past.

The fear that prefabrication of houses would reduce greatly the employment for site workers, particularly carpenters, has so far proved to be groundless. Many of the large residential builders have been able to achieve greater economies by suitable planning and mechanization of their work, than by purchase of the prefabricated houses available to date. Prefabrication on medium and small projects has reduced site work but has by no means eliminated it; prefabricated houses are very far from self-erecting. Manufacturers of factory-made "industrial houses"[4] which within recent months attained commercial introduction estimate very great reduction in the man-hours required for erection from the hours necessary with other construction systems. These estimates may be substantially correct, and houses of this type may prove much more popular than all earlier prefabrication systems. Even under these conditions, they are not a serious threat to building workers because by their nature they are highly standardized and thus are appropriate only to certain portions of the housing market. Production and sale of 100,000 such units a year would be a notable achievement for this particular industry and cannot be expected for several years at least. Such a volume would be about an eighth of the single-family houses built during a year of high residential activity. It would not mean hardship to building workers and might very well prove to be a helpful stimulation to other construction methods.

Neither are there signs of real danger for individual trades. Almost without exception, the work of the several trades has already been changed greatly. Fifty years ago plumbing commonly meant lead pipes for water supply; these have been replaced completely by steel pipes, and the steel pipes in turn partially replaced by copper tubes. The operations of handling, con-

[3] Value of work performed excludes the value of work sublet to others and so is less than total gross operating income for the year.

[4] "Industrial houses" are essentially an extension of prefabricated houses to include plumbing, heating, electric wiring, exterior and interior finish, in the factory operations, reducing above-ground site work to assembly. Those currently in commercial-scale manufacture are designed in metal rather than wood.

necting, and installing the pipes have changed correspondingly, but plumbers still do the work and many of the older plumbers have worked continuously since an apprenticeship in which lead work was one of the most important parts. During the last 10 years there have been several important changes in electric wiring usage —introduction and very rapid adoption of "bus ducts" for factory wiring, use of raceways beneath the floor instead of conduit for better grade commercial installations, virtual replacement of soldered connections for wires by mechanical connectors. These and other changes have been a development in the trade, without any change in its essential character. The electricians were not primarily men who installed conduit, wires, outlet boxes, etc.; instead they were primarily men who understood electric systems, and had the skills necessary to provide such systems as were wanted. Under these conditions, they were able to adjust to the new materials and methods without difficulty. Perhaps more basic has been the partial change from riveting to welding in structural steel erection but this likewise has been absorbed by the existing trade.

Distinctions between trades in a period of rapid technical progress are likely to be complicated and at times can be confusing. From time to time certain types of work have been transferred from one trade to another, and further transfers may be expected from time to time in the future. Such events are, however, minor in importance, and change the relative importance of the trades and their respective fields of employment only slightly.

Despite very great technical progress in construction, especially since the invention of steel-frame buildings, the only instance of obsolescence of a recognized trade was that of rubble stonemasons[5] following the rapid adoption of plain and reenforced concrete for foundations, abutments, retaining walls, and such uses. The conditions here were quite unique in that this trade was completely dependent on continued use of a single type of material in one broad field of application. When this material, requiring special skills for its installation, was completely superseded by another material for which those skills were useless, collapse of the trade was unavoidable.

None of the existing trades are in this hazardous position. Brickwork has become unimportant as a load-bearing member for tall buildings and buildings designed for heavy floor loads. Yet there is an acute shortage of bricklayers, and every reason to expect that their work will continue to be an important basic trade indefinitely. Brick and other masonry units which they handle have so many desirable characteristics for so many different uses that it is hardly possible to picture a construction industry from which these have been eliminated. Ornamental plastering has become less common than 20 years ago and other materials than plaster have been used for surfacing of walls and ceilings, but there is an acute shortage of plasterers and every reason to expect that plastering will continue to fill a place for which no other treatment is fully satisfactory. Meanwhile the recently developed use of plaster as a fire-resistive covering for structural steel may well become common—if not indeed standard—opening a new field for plasterers' employment. Carpentry has been changed by the use of electric hand tools, by more completely fabricated millwork not requiring fitting for installation, by hardware designed for easier and quicker installation, by much better planning of site work; but it is still the largest single trade and will remain so during the predictable future. It is interesting to note that widespread use of reenforced concrete instead of "mill construction"[6] for multistory buildings intended for heavy floor loads created work for carpenters in building the concrete forms while it took work away from carpenters on the permanent floors, beams, and columns.

Those entering the skilled building trades may expect that their occupations will change during their years of active work. Individual trades will gain employment by some changes and lose by others. For the trades as a whole there is little doubt of a long-time trend toward use of more fully standardized and more completely fabricated materials in many kinds of building construction, toward more complete

[5] Rubble stone is still used in some localities for its ornamental value, but such use is trivial compared to the former use as a major structural material in nonbuilding as well as building construction.

[6] A design using heavy wood floors supported by joists resting on wood beams, which are carried by the exterior walls and by wood columns.

mechanization of site work, and toward the replacement of small pieces of material used in great quantity by fewer but larger pieces of different materials. All of these mean increasing productivity and, hence, fewer hours of employment for a given final result. These changes are not a threat to those about to enter the building trades, however, because from their nature they are slow and very gradual. Natural turn-over of workers will provide more adjustment than is needed. Hence, apprenticeship training of additional workers will continue to be needed indefinitely, although not necessarily at the present numerical rate. It is recognized that employment opportunities for apprentices and journeymen would be greatly reduced in a serious recession, with a temporary excess of competent workers in all the skilled building trades. This consideration results directly from the economic forces governing construction and is irrelevant to technological changes affecting employment opportunities.

As mentioned in the summary, prospects are poor for boilermakers, painters, and paperhangers as compared to other trades. In the case of boilermakers, reduction of employment in the construction field is not a reason and is not expected to occur. A further statement on the situation is made in the section on each of these occupations.

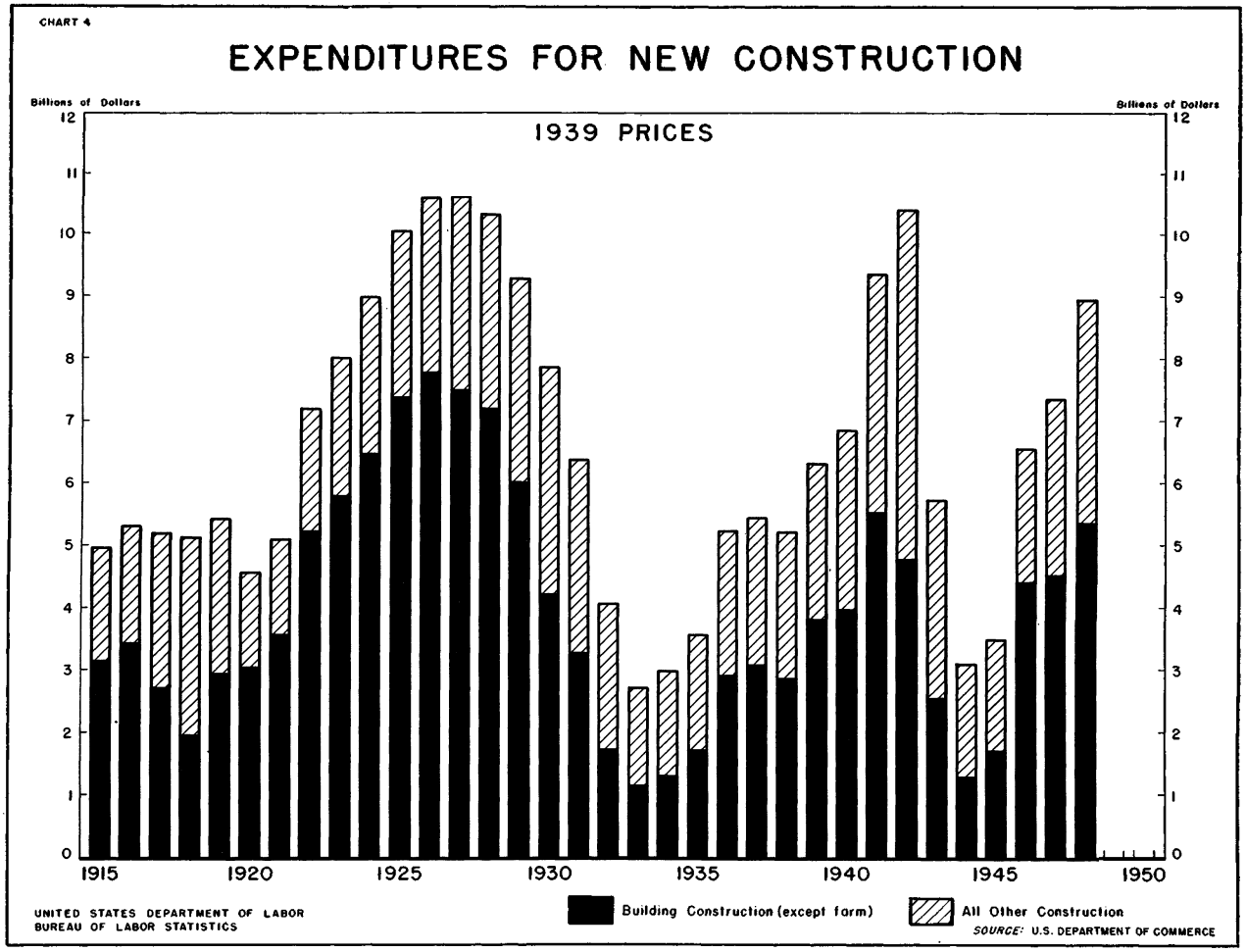
Consideration of the relative prospects of the individual trades should, however, take into account a long-range increase in emphasis on mechanical equipment in almost all kinds of buildings. This change has proceeded at varying rates for about two generations and shows every indication of continuing. If so, the relative positions of the individual trades will be changed somewhat.

Mechanical equipment includes plumbing, central heating, electric wiring, ventilating and air conditioning, refrigerating apparatus, industrial piping, and means for interior transportation (elevators, moving stairways, conveyors, numerous other devices) built into the structure.[7] With changing standards and the availability of a wider range of useful items, the extent to which such equipment is used has increased steadily. Anything in excess of one bathroom in a house was a mark of luxury about a generation ago, but this is no longer the case. A bathroom with two wash basins is probably still a luxury feature, but much less clearly so than when it first came into use—about 1940. For certain types of manufacturing plants an air conditioning-installation has become almost as important as the factory machinery in maintaining quality standards for the product. Many other illustrations could be given.

Over-all increase in the work of the mechanical trades means that employment in these trades is likely to make up a larger part of the total, and the work of the other trades a smaller part of the total. But this does not mean an actual reduction in the work of these other trades from what it would otherwise be, except under two conditions: Where mechanical equipment in an industrial or commercial building permits a reduction in space requirements for a given volume of business, or where the cost of mechanical equipment in a residential building is met wholly or partially by a reduction in over-all size.

Another change significant to employment prospects has been in ornamental design. Ornate buildings are much less common than even a generation ago and far less common than two generations ago. The practice of clothing buildings with an exterior covering so that to some degree they resemble buildings of a quite different type or buildings constructed at an earlier period is likewise less common. The design possibilities opened by modern technology are being used to an increasing degree—large glass areas, comparatively simple lines, absence of ornamentation foreign to the purpose and the basic structural design of the building. This is not the place for an attempted discussion in the controversial field of classical versus modern architecture and particularly not the place to attempt to say which viewpoint is "right." It may be pointed out, however, that modern designs have already been used extensively in commercial architecture, including some of the most important office buildings of the postwar period, and have been used to some degree for university architecture. It is noteworthy that Walter Gropius, one of the best known of the "functional design" architects, is senior member of the group engaged to design a new men's residence hall project for Harvard University.

[7] Portable apparatus is in the field of furnishings, rather than that of construction.



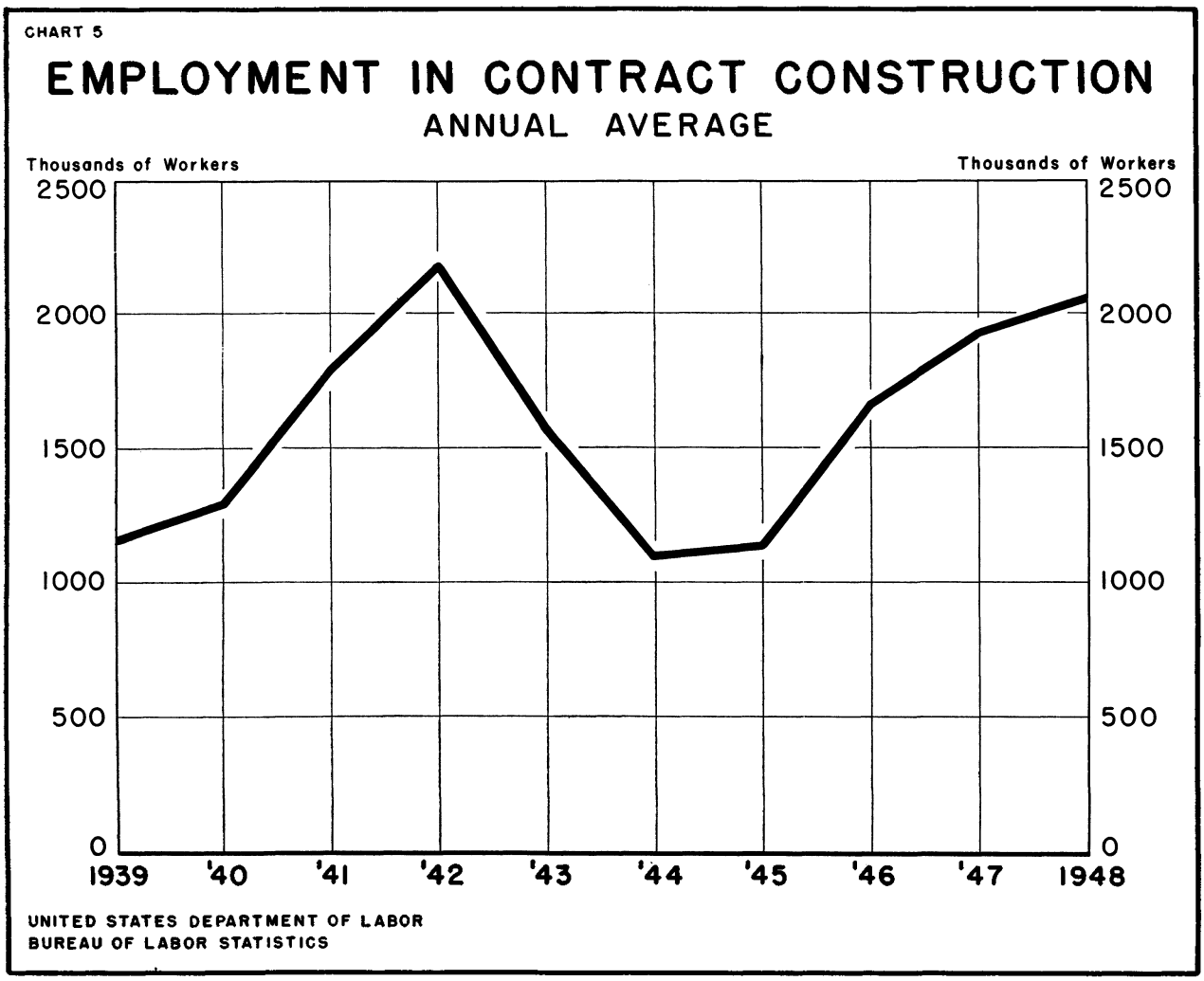
Furthermore, improved public taste has reduced the use of architectural veneers (such things as the imitation half-timbering on fairly cheap row houses built during the '20's, or the florid interiors of a great many of the movie theaters built at that same time), which are condemned by supporters of both classical and modern points of view with equal vigor.

To some extent this will mean decreased employment, but probably to a greater extent it will mean a change in the nature of employment. The choice for carpenters is not between half-timbering and partial unemployment; other work such as installation of storage and kitchen cabinets has since come to be used much more extensively than in the 1920's. Even for plasterers, the trade affected most strongly, the partially discontinued types have been replaced by new and increasing types of work such as accoustical plastering, fireproofing of steel, and an increase in the use of suspended ceilings. These developments mean an increased emphasis on work aimed at utility and convenience rather than on ornamentation as an end in itself.

Booms and Depressions in Construction Activity

The unusual dependence of new construction on general business conditions must be taken into account in any consideration of its occupational prospects. The construction industry's products are necessities rather than luxuries on the whole, but they have great durability. Hence at any time the supply of existing structures of a given general type is many times as great as the number of new ones which can be built, and the existing supply meets the major part of the need. Under unfavorable economic conditions, a large part of the demand for new construction can be and is postponed.

CHART 5



During times of increasing prosperity, new construction activity is speeded up to meet current needs, to catch up with the backlog of unmet past needs, and, with continuing prosperity, to anticipate future needs.

This situation is shown in chart 4 and in tables 1, 2, and 3. The picture given by these must be modified to some degree, however. The building boom of the late 1920's was magnified by highly unsound financing which has not since reappeared, and for which the necessary machinery was almost completely destroyed in the collapse which followed. It is, therefore, unlikely that the types of buildings most affected at that time by blue-sky financing (larger apartment buildings, hotels, office buildings, and, to some extent, amusement buildings) will be built so greatly in excess of current requirements and, hence, unlikely that there will be a later period of several years in which construction of these types is almost completely prevented by such a great oversupply.

With the oversupply resulting from an unregulated boom reduced, the other "morning after" effects will be reduced as well. Much more conservative financing, combined with solvent insurance of residential mortgages, mean that losses to investors and property owners in a declining market will be below those of the early 1930's. Monthly payments to reduce the indebtedness on residential mortgages, now the customary arrangement, mean likelihood of fewer foreclosures and hence a smaller quantity of property for sale at distress prices to compete with new construction. Speculation in securities and commodities is less extensive than in the 1920's and seems likely to remain so, and speculation in vacant property,

at that time exceedingly common, is now quite limited in extent. Hence the loss of capital funds in some future downward movement of general prices is likely to be less rapid and much less disastrous than in the early 1930's.

Table 1.—*Expenditures for new construction in 1939 prices for sources of funds, 1915-48*

[Millions of dollars]

Year	Total new construction	Privately financed	Publicly financed
1915	4,984	3,806	1,178
1916	5,305	4,304	1,001
1917	5,209	3,657	1,552
1918	5,109	2,657	2,452
1919	5,413	3,625	1,788
1920	4,570	3,690	880
1921	5,078	3,867	1,211
1922	7,183	5,754	1,429
1923	8,002	6,761	1,241
1924	8,993	7,519	1,474
1925	10,027	8,297	1,730
1926	10,569	8,804	1,765
1927	10,604	8,600	2,004
1928	10,314	8,163	2,151
1929	9,257	7,150	2,107
1930	7,857	5,269	2,588
1931	6,363	3,686	2,677
1932	4,057	1,814	2,243
1933	2,728	1,267	1,461
1934	2,971	1,413	1,558
1935	3,558	1,943	1,615
1936	5,210	2,865	2,345
1937	5,438	3,418	2,020
1938	5,203	3,102	2,101
1939	6,307	3,808	2,499
1940	6,858	4,246	2,612
1941	9,339	4,857	4,482
1942	10,390	2,508	7,882
1943	5,737	1,355	4,382
1944	3,103	1,397	1,706
1945	3,500	1,983	1,517
1946	6,556	5,167	1,389
1947	7,538	5,848	1,690
1948	8,969	6,982	1,987

Source: U. S. Department of Commerce, Construction and Construction Materials, Statistical Supplement, May 1949, tables 10, 11, and 12.

NOTE: Expenditures adjusted to 1939 construction prices are used rather than expenditures without adjustments, to give an approximate indication of changes in physical volume.

Despite these conditions, construction activity will not and cannot increase indefinitely; on the contrary, there will be periods of contraction during the working lifetime of those now enter-

Table 2.—*Expenditures for new nonfarm building construction by type in 1939 prices, 1915-48*

[Millions of dollars]

Year	Total nonfarm building	Residential building	Nonresidential building			
			Total	Industrial	Commercial	Other
1915	3,140	1,740	1,370	348	[1]	[1]
1916	3,428	1,835	1,593	398	[1]	[1]
1917	2,724	1,328	1,396	450	[1]	[1]
1918	2,272	890	1,089	492	[1]	[1]
1919	2,940	1,651	1,289	577	[1]	[1]
1920	3,026	1,276	1,750	794	501	455
1921	3,565	1,707	1,858	571	558	729
1922	5,229	3,055	2,174	485	647	1,042
1923	5,806	3,629	2,177	510	671	996
1924	6,454	4,246	2,208	432	700	1,076
1925	7,351	4,592	2,759	479	900	1,380
1926	7,792	4,551	3,241	679	1,039	1,523
1927	7,494	4,282	3,212	667	1,085	1,460
1928	7,189	3,956	3,233	768	1,068	1,397
1929	6,009	2,742	3,267	934	1,041	1,292
1930	4,224	1,453	2,771	587	846	1,338
1931	3,252	1,339	1,913	277	482	1,154
1932	1,745	595	1,150	99	274	777
1933	1,149	358	791	232	167	392
1934	1,299	428	871	230	204	437
1935	1,720	821	899	180	250	469
1936	2,901	1,388	1,513	290	332	891
1937	3,070	1,532	1,538	468	386	684
1938	2,898	1,575	1,323	237	282	804
1939	3,823	2,179	1,644	277	287	1,080
1940	3,986	2,463	1,523	563	338	622
1941	5,520	2,853	2,667	1,754	371	542
1942	4,798	1,576	3,222	2,797	127	298
1943	2,554	1,094	1,460	1,290	25	145
1944	1,285	542	743	533	42	168
1945	1,722	522	1,200	789	149	262
1946	4,405	2,202	2,203	1,008	708	487
1947	4,531	2,797	1,734	830	406	498
1948	5,353	3,393	1,960	611	535	814

[1]Not available.

Source: U. S. Department of Commerce, Construction and Construction Materials, Statistical Supplement, May 1949, tables 10, 11, and 12.

NOTE: Expenditures adjusted to 1939 construction prices are used rather than expenditures without adjustments, to give an approximate indication of changes in physical volume.

ing apprenticeship. The conditions do mean, however, that contraction is likely to be less rapid and less severe and will probably be cushioned by conditions absent in the past—a solvent mortgage market, a moderately reasonable supply-demand relationship for existing structures, less widespread and less severe disorganization of investment funds from speculative losses, and partial support of consumer purchasing power (including ability to pay rent) through unemployment compensation and other social security measures.

Table 3.—*Average annual employment of wage and salary workers*

Year	All nonagricultural industries (thousands of workers)	Contract construction	
		(thousands of workers)	(percent of nonagricultural total)
1929	31,041	1,497	4.8
1930	29,143	1,372	4.7
1931	26,383	1,214	4.6
1932	23,377	970	4.1
1933	23,466	809	3.4
1934	25,699	862	3.4
1935	26,792	912	3.4
1936	28,802	1,145	4.0
1937	30,718	1,112	3.6
1938	28,902	1,055	3.7
1939	30,287	1,150	3.8
1940	32,031	1,294	4.0
1941	36,164	1,790	4.9
1942	39,697	2,170	5.5
1943	42,042	1,567	3.7
1944	41,480	1,094	2.6
1945	40,069	1,132	2.8
1946	41,494	1,661	4.0
1947	43,970	1,921	4.4
1948	45,131	2,060	4.6

Sources: 1929 to 1944 estimates, U. S. Bureau of Labor Statistics, Monthly Labor Review, December 1947, Industrial Employment in War and Peace; 1945 to 1947 estimates, U. S. Bureau of Labor Statistics, Employment and Pay Rolls Detailed Report, April 1948; 1948 estimates, ibid, Feb. 1949.

In a recession there will undoubtedly be attempts to support construction activity by an expansion of publicly financed construction. This will be helpful in maintaining construction employment, but its effect can easily be overestimated. Except for war years and years of war preparation, the greatest year-to-year increase in total public construction activity (measured in 1939 prices as an approximation of a measure of physical volume) was that from 1935 to 1936. This increase in expenditures was 730 million dollars, a very impressive amount, but less than three-quarters of the predepression reduction in private expenditures from 1928 to 1929 and less than two-fifths of the private reduction from 1929 to 1930. The course of public expenditures from 1929 to 1936, shown in table 1, shows that a substantial increase in public expenditures came a year later than a similar increase in private expenditures. It also shows that public expenditures in 1935 were little more than a tenth greater than in 1933, the bottom of the depression for construction as a whole, and actually much less than in 1932.

It is apparent that expansion of public construction has been neither prompt enough nor great enough to prevent serious unemployment of construction workers released from private jobs. If there should be another major contraction of private construction activity, it is likely that the public construction program will be changed in both of these respects and will mitigate unemployment more completely than in the past. Nevertheless for a number of reasons[8] public building programs cannot be expected to support construction employment fully without interruption. It is most unlikely that a situation like that from 1932 through 1935 will be repeated for construction workers; but it is at least as unlikely that the present employment situation, wherein most skilled building workers have been in a sellers' market for their services, will continue permanently.

Seasonality of Employment

Seasonal unemployment is a very old problem in construction. Much of the work is outdoors, where both materials and workmen are affected by the weather. Later indoor work

[8] Some of the more important of these reasons are: The time required for recognition of a significant drop in private construction activity; the time required after such recognition for the actual start of work; the low percentage of skilled building workers needed in some of the most important types of public construction, such as highway work; the drastically changed conception of public functions if the rate of public residential or nonresidential buildings or both is to be expanded sufficiently to offset completely a really serious drop in private building construction. Space limitations prevent discussion of these reasons.

(interior rough carpentry, plastering, finish carpentry, interior painting, etc.) is also affected, although usually to a smaller degree, because of seasonal variation in the rate at which buildings are ready for these operations. In past years seasonal variation in residential building activity has been increased by a tendency in many localities to schedule houses and, particularly, apartment buildings, so that they would be completed shortly before one or two annual "moving days." The long-range trend is toward some degree of improvement, but there are no indications as yet that seasonal unemployment will be eliminated.

An indication of seasonal unemployment is given by estimates of monthly employment. For such comparisons, 1939 is the most satisfactory year because the seasonal pattern of later years was greatly modified by abnormal conditions of the prewar defense period, the military and industrial construction of the early war period, the later period of wartime contraction and limitations, and then the postwar expansion. According to Bureau of Labor Statistics estimates of employment in the contract construction industry, the number of workers employed during the low month of 1939 (February) was below the average of the year by 234,000, or 20 percent; the number employed during the peak month (August) was above the year's average by 161,000, or 14 percent. Thus at the annual peak, 42½ percent more workers were employed than at the seasonal low. These estimates include the contractors' shop and office employees, for whom seasonal variation is less than for site workers. Figures for the 6-year period from January 1939 through December 1944, which took in the prewar and wartime expansion and then the contraction of the later war period, show February employment about 13 percent below the annual average and August employment about 10 percent above. These 6-year averages understate seasonality, however, because they are influenced greatly by the highly abnormal wartime construction program.

Monthly employment data for 1939 as reported in the 1939 Census of Construction, prepared in a different manner from a different type of data, show even greater seasonal variation—employment in the low month of the year 25 percent below, and employment in the peak month 16 percent above, the annual average. In the building field, seasonal variation was much greater for builders than for general building contractors because of the desire for completion dates fitting sales and rental seasons and because builders do not commonly undertake alteration and repair jobs. For all general contractors the variation was even greater than for builders because of the inclusion of highway contractors whose work is highly seasonal.

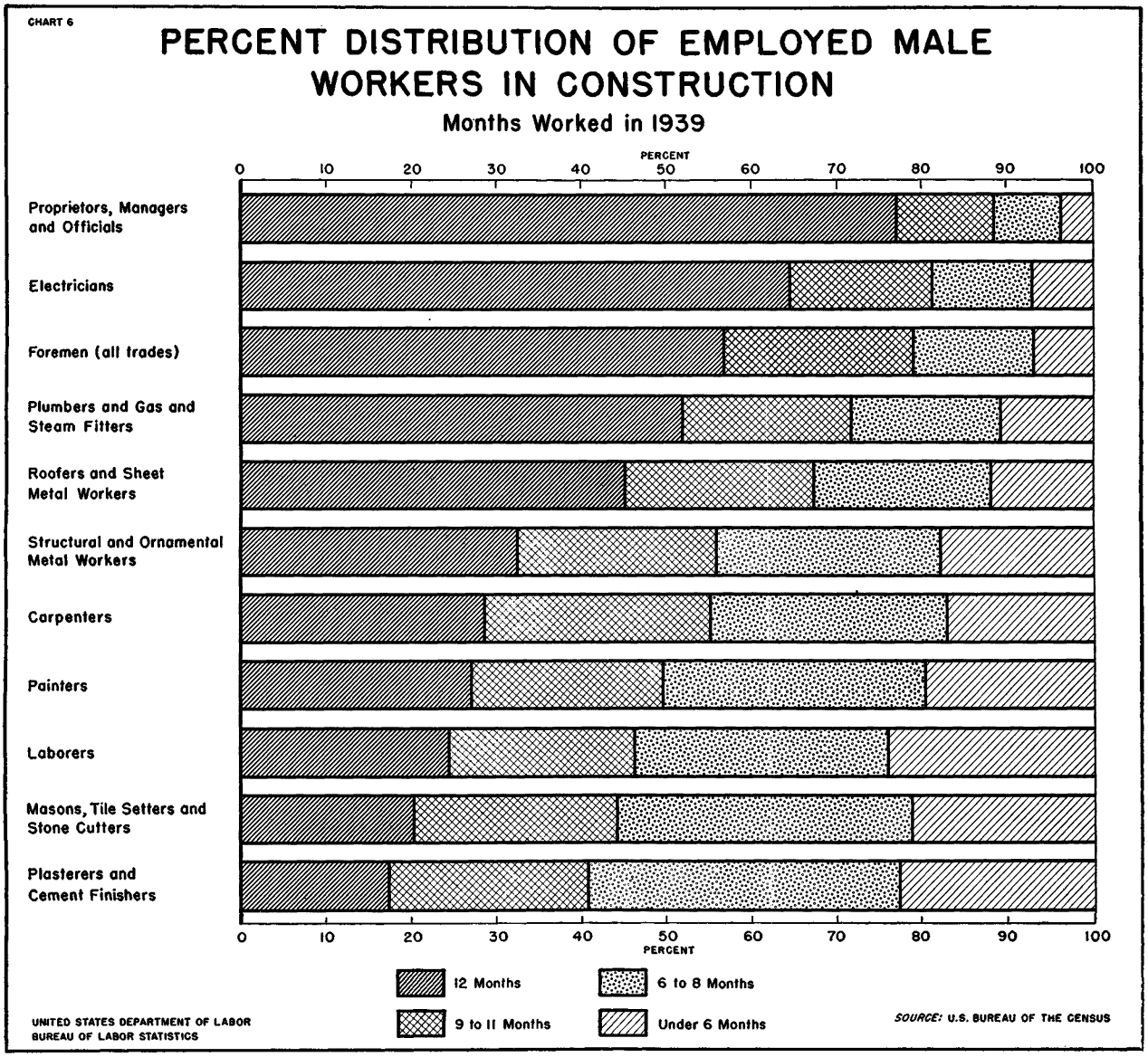
Table 4.—*Months worked in 1939 by male wage or salary workers in the construction industry*

Months worked	Number of workers	Percent of total
Total	2,176,483	100.0
Without work in 1939	143,458	6.6
Months worked in 1939:		
Under 3	98,335	4.5
3 to 5	284,364	13.1
6 to 8	560,684	25.8
9 to 11	457,347	21.0
12	598,639	27.5
Work not reported	33,656	1.5

Source: 16th Decennial Census, vol. III, The Labor Force: Occupation, Industry, Employment and Income, Part 1, United States Summary, table 89, p. 274.

The special trade contractors as a whole differed comparatively little from general building contractors, but differed very greatly among themselves by trade. On the whole, employment was most regular in those fields where alterations, maintenance, and repair work indoors are important—electrical work, plumbing, glazing, and elevator construction. Painting with and without paperhanging and decorating were outstanding exceptions. These had the highest percentages of seasonal unemployment despite the very great importance of indoor redecorating, because the winter months are unpopular for such work.

Information presented in the Labor Force portion of the 1940 census for men in the entire construction industry shows (table 4) that in 1939 little more than a quarter of them were employed throughout the year, and not quite



half of them for as much as 9 months. Almost a quarter were employed for less than 6 months, including those entirely without work during the year. These figures are for the industry, including the "proprietors, managers, and officials" group, office workers, shop workers and foremen, as well as site workers below foreman status.

Similar information is given in tables 5 and 6 for certain construction occupations and occupational groups; for journeymen, the figures include men working in other industries, such as maintenance painters and maintenance carpenters employed by factories, hotels, and other nonconstruction establishments. In some trades, particularly carpentry and painting, the tables probably overstate the extent of complete unemployment during the year and also the extent of employment for very short periods —3 months or less. The reason for this is that they include persons beyond normal working age and, since the classifications are based on occupations as reported to the enumerators, undoubtedly include many workers below the general standards of skill and competence.

Even with allowance for this situation, the tables indicate that in most trades full-time employment was enjoyed by a minority, and

Table 5.—*Months worked in 1939 by male wage or salary workers in certain construction occupations*

[number of workers]

Occupation	Total	Without work in 1939	Months worked in 1939						Months worked in 1939 not reported
			Under 3	3	4 and 5	6 to 8	9 to 11	12	
Proprietors, managers, and officials (construction)	28,940	660	260	280	560	2,140	3,200	21,500	340
Foremen (construction)	57,320	1,420	840	780	2,200	7,860	12,200	31,320	700
Carpenters	553,080	19,920	21,700	18,760	45,700	140,820	133,620	144,360	8,200
Electricians	188,320	6,240	3,320	3,080	6,600	21,120	29,860	116,160	1,940
Masons, tile setters, and stone cutters	114,100	5,860	4,680	5,480	12,500	36,860	25,220	21,360	2,140
Painters	273,060	16,040	12,380	11,340	26,600	77,500	56,420	68,140	4,640
Plasterers and cement finishers	55,280	3,200	2,320	2,380	7,060	18,740	11,940	8,780	860
Roofers and sheet metal workers	100,220	4,360	2,820	2,660	5,940	19,620	20,940	42,700	1,180
Structural and ornamental metal workers	33,760	1,800	1,420	1,220	3,020	8,300	7,340	10,180	480
Plumbers and gas and steam fitters	149,960	6,120	3,660	3,620	8,140	24,740	28,100	73,520	2,060
Laborers (construction)	771,540	79,020	46,900	35,940	81,340	202,340	146,900	164,620	14,480

Source: 16th Decennial Census, Population, The Labor Force (Sample Statistics), Occupational Characteristics, table 13, pp. 174-175.

in some trades by a rather small minority. For "proprietors, managers, and officials," which includes superintendents, estimators, and others having major responsibility as well as the officers of incorporated construction firms, only about three-quarters were employed throughout the year and more than an eighth were employed for less than 9 months. For construction foremen as a whole, not greatly over half were employed for all 12 months of the year and little over three-fourths for as much as 9 months. Information for foremen by individual trade is not available.

Among journeymen, year-round employment was commonest for electricians, but even so more than a fifth of them were employed for less than 9 months.[9] Plumbers, gas fitters,[10] and steam fitters were next in regularity of employment, but not quite half of them had full-year employment, and about a seventh of them were employed for less than 6 months or not employed at all. Most of the occupations or groups included in the table show very large numbers in the classifications of employment for 6 to 8 months and 9 to 11 months. Four skilled groups (masons, tile setters, and stonecutters; plasterers and cement finishers; painters; and structural and ornamental metal workers) had large numbers employed for only 4 or 5 months, as well as substantial numbers employed for shorter periods.

The length of the active construction season differs from one section of the country to another, depending largely upon climate. In parts of the country where winters are mild, construction tends to operate on a more even year-round basis. For instance, construction activity in the Pacific and West South Central States is less seasonal than in the West North Central

[9] Data obtained in the 1939 construction census indicate that employment regularity was probably greater for elevator constructors but no separate tabulation for the trade was made for the Labor Force portion of the population census.

[10] Although included by name in the Census table, gas fitters have not ordinarily been regarded as a distinct trade since their combination with plumbers a number of years ago.

Table 6.—*Months worked in 1939—percent distribution of male wage and salary workers in certain construction occupations*

[percent of total]

Occupation	Total	Without work in 1939	Months worked in 1939						Months worked in 1939 not reported
			Under 3	3	4 and 5	6 to 8	9 to 11	12	
Proprietors, managers, and officials (construction)	100.0	2.3	0.9	1.0	1.9	7.4	11.1	74.3	1.2
Foremen (construction)	100.0	2.5	1.5	1.4	3.8	13.7	21.3	54.6	1.2
Carpenters	100.0	3.7	4.1	3.5	8.6	26.4	25.1	27.1	1.5
Electricians	100.0	3.3	1.8	1.6	3.5	11.2	15.9	61.7	1.0
Masons, tile setters, and stone cutters	100.0	5.1	4.1	4.8	11.0	32.3	22.1	18.7	1.9
Painters	100.0	5.9	4.5	4.2	9.7	28.4	20.7	25.0	1.7
Plasterers and cement finishers	100.0	5.8	4.2	4.3	12.8	33.9	21.6	15.9	1.6
Roofers and sheet metal workers	100.0	4.4	2.8	2.7	5.9	19.6	20.9	42.6	1.2
Structural and ornamental metal workers	100.0	5.3	4.2	3.6	8.9	24.6	21.7	30.2	1.4
Plumbers and gas and steam fitters	100.0	4.1	2.4	2.4	5.4	16.5	18.7	49.0	1.4
Laborers (construction)	100.0	10.2	6.1	4.7	10.5	26.2	19.0	21.3	1.9

Source: 16th Decennial Census, Population, The Labor Force (Sample Statistics), Occupational Characteristics, table 14, pp. 195-196.

States. According to the 1939 Census of Construction, construction employment in the West South Central and Pacific States was only 15 percent below the yearly average in the lowest month of the year, compared with 39 percent in the West North Central States. The peak month in the first two geographic divisions was only 8 percent above the 12-month average as compared with a 26 percent increase in the West North Central division.

Seasonal fluctuations were also great in the Mountain States—with a low month 37 percent below the average; East North Central, 33 percent; New England, 29; and Middle Atlantic, 26. Construction in the States farther south —South Atlantic and East South Central— was also subject to seasonal slumps, but not to the same extent as the northern States. In these two geographic divisions, construction employment during the low month of the year dropped 23 and 24 percent below the yearly average.

Within several of the geographic divisions there are wide variations in climate, and, consequently, there are differences among the States in the length of the construction season. California is the only one of the three Pacific States with a particularly long construction season. However, since Oregon and Washington have a minority of the construction jobs, the division as a whole still stands at the top in the steadiness of construction employment.

In the Mountain States there are rigorous winters and a short construction season in Montana, Wyoming, Idaho, and many parts of Colorado. But two of the States—Arizona and New Mexico—have a mild climate. These two States—Arizona in particular—have comparatively little variation in construction activity, as measured by month-to-month employment data in the 1939 construction census. The South Atlantic is another group of States with varying climate. In South Carolina, Georgia, and Florida, construction activity is fairly steady the year-round, and seasonal fluctuations are greater in the other States—especially West Virginia, Delaware, and Maryland. In the other

geographic divisions, the seasonal pattern of construction activity is much the same for all States because the climate is fairly uniform throughout the whole division.

Protective measures against bad weather are available and scarcely any type of work can be regarded as impossible even under the most severe conditions. Deeply frozen ground can be excavated; concrete can be poured without danger of freezing in a temperature of 20° below zero; brick can be laid at such temperatures, when the urgency is sufficiently great. The necessary procedures are quite expensive, however, and labor cost is likewise increased in such weather—work is hindered by the heavy clothing needed, and for some operations there are occasional stops to warm up at a fire.

While weather must be regarded as a basic condition, on a long-range basis seasonality seems likely to be alleviated to some degree. Within quite recent years many builders and contractors have demonstrated that it is neither difficult nor expensive to get houses completely enclosed in a much shorter time than formerly had been customary. This means that a fairly brief period of mild winter weather is sufficient to enable a project to get past the state where it is handicapped most severely by winter weather. Once a building is enclosed, weather is much less important. Temporary heat at that stage is much less expensive than earlier, and the journeymen and others can work more productively because they are more comfortable and less burdened with heavy outer clothing. Unfinished outdoor work can be performed during stretches of mild weather. On comparatively large buildings, with a fairly long construction period, the seasons have been less influential than on small jobs. On these larger buildings, it is commonly unavoidable that some part of the work occur during winter; the contractors on the whole are much better prepared to handle winter work; and the size of the jobs makes winter protection a smaller part of total cost.

Certain advantages inherent in off-season work have received attention. Ordinarily the supply of materials is better, with little risk of a temporary shortage which may arise during the peak season. There is usually no problem of labor shortage at such times, and no need for a guaranty of overtime or payment of premium rates to get a sufficient crew of capable journeymen.

The disadvantages as well as the completely artificial nature of aiming the completion of houses and apartments at one or two days of the year have been rather widely recognized. When projects were delayed, there were serious complications for their owners, and commonly there has been substantial unproductive expense in overtime and other rush measures to meet the dead line. For the duration of the housing shortage, the time of completion does not affect the prospect of prompt sale or rental. The increased mobility of the population means a greater year-round rental and sales market than in the past, quite apart from that arising from shortage conditions. For apartment buildings there has been a basic change since the previous building boom from speculative to investment operation, without the former need for complete occupancy almost at the instant of completion in order to start payment of outstanding debts. Very commonly these projects now consist of a number of buildings scheduled for completion over a period of several weeks or a few months.

Complete correction of seasonal unemployment cannot be expected from these influences, however. The methods by which some manufacturing establishments have reduced seasonal differences in employment are, for the most part, inapplicable to construction. These include production for inventory during the dull sales season, adding products for which the seasonal peak comes during the dull season for original products, in at least one case an informal arrangement for transfer of employees between two firms whose seasonal peaks were several months apart, seasonal variation in hours worked with approximately uniform weekly pay and an adjustment at the end of the year, and other procedures. Production for inventory is not reasonably practical for most builders under conditions present thus far, and for contractors proper it is obviously impossible. Most types of contracting involve little or no shop work, and, in those fields where shop work is important, much of it is done to special design or special dimensions for individual buildings. Hence at best transfer of workers from site work to shop work can give little more than negligible alleviation. The industry,

its machinery and equipment, and its labor force, on the whole are not well suited to other products. It is unmistakable that the problem of seasonal unemployment is made more complicated by the very great changes in annual volume of construction with changing business conditions.

A noteworthy direct attack on seasonal unemployment was that of the International Brotherhood of Electrical Workers, which a few years ago proposed an annual wage plan under which there would be a substantial reduction in hourly wage rates for those contractors guaranteeing year-round employment. Comparatively few contractors have accepted this proposal so far. Any plan for spreading employment and earnings throughout the year by means of annual wage agreements or other possible methods faces incomparably greater difficulties than in an industry where the annual output is reasonably stable for the industry as a whole and for individual firms as well.

General Characteristics of Employment

Construction is active, strenuous work, but physical demands are not excessive. Most of the operations requiring principally muscle-power have been taken over largely by machinery, and for those where such a change has not yet been practical, such as carrying of heavy plumbing fixtures, custom and working agreements usually assign a sufficient number of men to prevent undue strain or risk of injury. Nevertheless the physical exertion of handling tools and materials is much greater than in most bench jobs and a greater degree of agility is required. Continuous standing is frequently involved, and from time to time it is necessary to squat, to work in cramped quarters, or to work in uncomfortable positions.

For many trades a large part of the work is outdoors, and for almost all trades much work is in unfinished buildings. This means exposure to the weather and low temperatures for some of the indoor work. Artificial heat is commonly provided for indoor winter work after buildings are sufficiently enclosed, but the temperatures maintained are frequently lower than those customary for winter factory work.

Since most construction activities last only a few months, and all are regarded as temporary, the facilities provided are usually rather primitive. On fairly large jobs, drinking water is provided by portable fountains, but a hose or a bucket and dipper are still in widespread use. On large jobs, particularly in downtown city locations, toilet facilities are provided with standard fixtures connected to supply and waste lines, and sometimes these compare favorably with good factory toilets. Elsewhere toilet facilities are crude, consisting most commonly of temporary outhouses; on some small outlying jobs, no toilets of any sort are provided. Showers are seldom if ever provided except occasionally at the very largest metropolitan projects, or at work camps for projects in remote locations. No formal arrangement for washing before lunch is common, but running water is often available at a hose hydrant. A shed is customary for storage of clothing, lunches, etc., and for overnight storage of overalls and tools, without individual lockers; although locked outside of working hours, these give little protection against burglary, especially on small jobs not having a watchman.

The location of construction work in any area is changing constantly, so that wherever a worker lives he often has to make a fairly long trip to and from work. In cities of moderate or large size a definite working area is usually established, which generally is the city itself exclusive of the suburbs; for jobs outside of this area, transportation cost is paid by the employer, and the time needed for suburban transportation is considered and paid for as working time. Comparable arrangements are commonly made for inconveniently located jobs within the designated working area during periods of labor shortage, but not at other times.

All skilled workers need tools, the number and total cost depending on the trade. These are owned by the journeymen, except that in the electrical and pipe trades working agreements frequently provide that all tools are to be provided by the contractors. A set sufficient for most needs is bought during apprenticeship. Later purchases are customary to obtain less common tools and new types of tools, to replace those lost or stolen, and to replace usable tools with improved or better-quality models. Theft of entire tool kits outside of working

hours has been troublesome, especially on outlying jobs. Not so many years ago the entire loss, which for a carpenter would be well over $100, was borne by the individual workman. Working agreements now usually provide that at least a large part, and in some cases substantially all, of this loss be borne by the employer.

Employment is predominantly on an hourly basis, with time off for sickness or personal business accompanied by loss of pay. Lost time because of bad weather or other reasons beyond the workers' control likewise means loss of pay, a serious matter to bricklayers and others doing outdoor work. Holidays are unpaid, except that in a very few areas working agreements provide pay for some of the trades on the major public holidays. Standard working hours have been established almost everywhere, most commonly from 8:00 to 4:30 on Monday through Friday; in some trades and localities the standard workday is 7 hours or 6 hours. Usually work at other times is paid for at a premium overtime rate, regardless of whether or not the standard hours have been worked.

Employment and lay-off practices are highly informal, in keeping with the flexibility of the construction industry. This informality is made practical by the craft or trade approach in training, whereby a fully trained worker can perform any type of work in his field. Hence, while workers are ordinarily laid off as soon as they are no longer needed, they are hired readily and with scarcely any formality at any project at which additional workers are wanted. Experience and preference within the rather broad field of any trade influences both applicant and foreman in hiring, but these are not rigid; a carpenter who enjoys the careful workmanshp of "trimming" (installation of millwork, hardware, finish carpentry in general) would ordinarily seek such work if unemployed but, if necessary, would take and be acceptable for other carpentry work; and a foreman having trimming to be done would ordinarily prefer an applicant specializing in such work but, in the absence of such an applicant, would hire any competent carpenter for the work.

Employment in a given trade is naturally much more stable in any employment area than in the work of a single contractor. Some jobs are starting as others are finishing, and some contractors are hiring workers as others are laying off. Hence, getting a new job is ordinarily a simple matter when construction is reasonably active, involving little lost time—often none at all. Even in good years, however, there is seasonal unemployment. As the rate of activity goes down seasonally from October to February, workers are being hired for new projects at a slower rate than they are being laid off at projects approaching completion. From late fall until early spring, lost time between lay-offs and new jobs is greater for most workers than in spring, summer, and fall.

For most trades migration is a matter of choice, although there are exceptions. When large construction projects are undertaken in small communities or in isolated localities, comparatively few of the workers live within reasonable commuting distance. When employment is high, acceptance of such a job is purely voluntary, and, presumably, few of the workers who go to them have strong ties with their home localities. When employment is only fair, men with family responsibilities have to choose between the prospect of intermittent unemployment at home and of a long, steady job elsewhere. This condition is not unique to construction but is more prominent in that industry than in most manufacturing industries.

Permanent migration is possible at most times for construction workers who want to move because of supposedly better long-time prospects in another locality or for any other reason. For union members, such a move involves transfer of membership. Like other unions, the building trades unions are organized through local chapters (known as locals), each having jurisdiction in a designated area. Membership is first and most directly in the local, which confers full rights within its area but not elsewhere. A member moving elsewhere can exchange his membership card for a card in the local at his new vicinity, subject to certain qualifications in the case of some of the trades. Thereafter he is a member in the new but not the old locality; should he wish to return, it is necessary for him to obtain another transfer; in some trades, acceptance of additional members is ordinarily governed by current and prospective employment conditions

within the local's territory. In some cases (particularly for electricians and plumbers) moving to another locality makes it necessary to get a journeyman's license from the local municipal or State licensing board.

Choice of a new home locality is much wider for a member of any of the common building trades wishing to migrate for personal reasons than for a member of most occupations in manufacturing. The reason is the wide distribution of construction work. This choice is, of course, more restricted in the less common trades—work for which is much more concentrated geographically.

The building trades offer certain satisfactions to the worker. Building work differs from a great many other occupations in the evident relationship between any individual worker's efforts and tangible, satisfying results. Even on very large jobs, where the work has been carefully organized and specialization is extensive, this relationship is apparent; the workers can see the building or other project growing before their eyes. The same is true of those working in early stages, even at unskilled occupations such as hand excavating for concrete footings—although most of the work remains to be done, the relationship between the work at hand and the finished building is plain and unmistakable.

Combined with this are other factors tending to bring a feeling of satisfaction, one of which is independence from any single employer or foreman. Persons having habitual difficulty in dealing with others will of course find their relations with employers, foremen, and fellow workers troublesome in any of the building trades, just as they would elsewhere. But for those whose relations tend to be reasonably harmonious, there is little risk of subjection to a domineering foreman or employer. For journeymen as a whole, their individual futures are tied up with their trades rather than with their employers at any particular time. Competence in any of the recognized trades is a sufficient asset which need not be (and ordinarily is not) supplemented by willingness to accept unjust or abusive treatment. The building trades are the one large field in which a worker can and does change jobs freely and, if the circumstances seem to warrant, can express his opinion of his foreman or employer without damaging his prospects for employment elsewhere.

Outdoor and semioutdoor work and changing locations have their disadvantages, already mentioned, but have the undeniable advantage of tending to prevent any feeling of monotony or confinement. This feature may be unimportant compared with other characteristics of the trades, but, in combination with the notably independent status of individual workmen, the variety in types of work commonly done in the course of a year and the direct evidence of accomplishment are ordinarily a source of real satisfaction.

Informal Personnel Practices

A contractor's total employment requirements at any particular project are likely to vary fairly rapidly, and his need for workers in a particular occupation varies even more rapidly. Peak requirements lasting only a few days, or even only a day or so, are by no means uncommon.

Special trade contractors are able to meet this situation fairly well by transferring workers from one job to another, since they usually have a number of jobs in some stage of progress at a time. Even they, however, are ordinarily unable to schedule these for continued uniformity of their total employment because their ability to proceed at any job is dependent on the readiness of related work done by the general contractor or other special trade contractors. General contractors have less flexibility in this respect because their business usually consists of a smaller number of individually larger jobs[11], so that lay-offs are more common for their workers.

Hence, employment is on a temporary rather than a permanent basis. It is true that many thousands of journeymen have worked steadily for the same employers for years and that contractors have no more desire than other employers to lay off satisfactory workers unnecessarily. Nevertheless the conditions under which the industry operates have created the general understanding that employment can be terminated at any time.

[11] Larger as measured by the value of work performed by the contractor's own employees, or by the hours worked by those employees. In this sense, any particular building is a much larger job for the general contractor who puts up the basic structure than for any of the special trade contractors.

Since work for any given employer is usually temporary, employer-employee relations are traditionally informal and commonly casual. Building workers tend to regard themselves as members of given trades, rather than as employees of given contractors. The permanent asset is competence in a recognized trade, rather than seniority or other preferential status with a given firm.

Journeymen are ordinarily hired by the foreman. He selects applicants at the job and often telephones men he knows to offer them work. For some trades in some localities, agreements provide that contractors or foremen shall inform the union office of need for additional workers and shall hire those sent in response, but with the right to dismiss any regarded as unsatisfactory after a brief trial.[12] Hiring through the union office is also done in cases where it is not required by working agreements. The foreman also discharges employees, at any time and for any reason—reduction in force, dissatisfaction with work, or merely personal antagonism. A newly hired worker may be discharged after a few hours while hiring in the same trade is still in progress. He is subject to lay-off at any time, either permanent (as the work for which he was hired approaches completion) or temporary, with instructions to return at a stated time, because of a temporary shortage of material, or to allow other trades to complete work which must be done before he can proceed further with his own work. A carpenter discharged from work on concrete forms because he is too painstaking and therefore too slow for that grade of work, may be hired readily by the same foreman at a later stage of the same job for installing millwork, where his careful workmanship is appropriate. The other side of this arrangement is that a workman is free to quit at any time for any reason—to take a job closer to home, a job likely to continue for several months, a job expected to provide more hours of work weekly because of greater overtime or better protection from weather interruptions, a job in a specialty of his trade which he enjoys particularly, or for any other reason.

There are no formal employment records, in the sense in which these are commonly maintained for factory employment. Workers are hired principally on the basis of apparent ability to do the work on hand; they tell the foreman about the work they have done and, if hired, are kept on the job as long as work is available for which they are satisfactory.

A contractor whose volume of work permits usually tries to retain a semipermanent nucleus of journeymen who, he has found, can do a good job, expanding this nucleus by hiring others as needed and then laying them off when the peak is over.

Along with its undesirable features, this rather loose employment relationship has two very real advantages to journeymen. The first is separation of their own fortunes from those of any single employer. Seniority is not a consideration in either hiring or lay-off.[13] Hence, discontinuance of a firm from death or retirement of the proprietor, or from bankruptcy or voluntary liquidation, from an employment standpoint is merely an incident to its workers, whereas it is a disaster in those industries having irregular employment along with strict seniority. The second advantage is the personal independence in action and attitude of workers whose employment is governed by their own competence along with general business conditions rather than by their standing in a single business firm.

Opportunities for Advancement

On satisfactory completion of apprenticeship, a young man graduates to the status of journeyman, or all-round skilled worker in his trade. If his apprenticeship has been under direction of a joint union-employer committee or other arrangement approved by the union local, he becomes a journeyman member, having the same rights and responsibilities as the other members. If his apprenticeship has been in a program not recognized by the union, he becomes a journeyman eligible for employment on any jobs where union membership is not required by working agreements.

[12] These agreements provide that workers may be hired otherwise, if the union is unable to provide men within a specified period. They are subject to such pertinent legislation as may be in effect from time to time.

[13] In a very few areas there have been partial seniority systems for some trades, providing that workers on a particular project shall be laid off in reverse order of their hiring on that project. This is quite different from a company-wide seniority system; the difference in seniority standing between the lowest and the highest man on the list is seldom more than a few months and, frequently, is only a few weeks.

Usually he continues in journeyman status for several years, for the purpose of broadening his experience in his own trade, increasing his skill and his detailed familiarity with any particular field in which he is especially interested, and increasing his knowledge of the related work of other trades and of construction as an over-all process. Although this period seldom brings an advance in hourly wage rate over the agreed local scale,[14] it brings development in knowledge and skill which will be valuable for the remainder of his working life.

During normal employment conditions, with neither labor shortage nor substantial unemployment, on high-quality jobs journeymen known for unusual skill in any particular part of their field are commonly paid a small premium above the agreed scale.[15] More important, such men are usually the first to be hired and the last to be laid off. Contractors having fairly continuous work try to retain these men, transferring them to successive projects and, when necessary, assigning them to other types of work within their trades. Such premiums are for outstanding craftsmanship in finish work (installation of millwork, etc.), for ability to lay out complicated work correctly without detailed instructions or loss of time in wondering how to proceed, etc.; they are entirely distinct from premiums for excessive speed.

In some cases premiums are paid for production, usually on lower grades of work, even though these are almost universally forbidden by union agreements. These take several forms —direct premiums above the established hourly rates for those meeting a specified production schedule, piecework rather than hourly wage rates, or sometimes piecework disguised as subcontracting (commonly known as "lumping") in which one workman or a small group organized as a temporary, informal partnership agree to install specified materials to be provided by the contractor in one or more buildings for a stated payment. While not enough is known about incentive payments in construction work to justify a comprehensive statement, there is little doubt that the payments for speed have frequently been unwholesome and undesirable. In many cases they have tended to encourage overwork, excessive hours, inferior workmanship, and a disregard for the related work of other trades and for orderly progress of the entire job. Few of the incentive payment plans can be regarded as advancement from any standpoint except that of high temporary earnings.

The first real promotion a man may expect is to foreman, in charge of his employers' crew on a small job, or on a large job in charge of a particular crew, under a general foreman or superintendent. Responsibilities of a foreman and the basis on which his selection usually rests, are stated on page 36. On union jobs, foremen are union members having the same status in union affairs as journeymen. They are paid an hourly rate usually 10 percent or more above the journeyman's rate and, commonly but by no means always, are paid for a full week despite any loss of time from bad weather or other interruptions. A satisfactory foreman is likely to have steadier employment than a journeyman and, if his employer's work permits, he is transferred from job to job as a matter of course. When work is slack, a good foreman is likely to be offered employment as a journeyman instead of being laid off, sometimes at a premium rate and occasionally at his full foreman's rate. There is turn-over among foremen, however, because of the great variation from time to time in the scale of many contractors' activities. A man may be hired as a foreman by a contractor for whom he has never worked previously, especially by a very large contractor or an out-of-town contractor, but this is unlikely to occur unless he has already had experience as a foreman. His original promotion ordinarily comes from a contractor familiar with his abilities.

The next step in promotion as an employee is to general foreman or superintendent. Here the situation differs among trades, but in all cases such a man is a full-time management representative of the contractor and does not work with tools or install materials. Payment is ordinarily on a straight salary basis and is commonly 25 to 50 percent above full-time hourly earnings for his trade—the amount depending on his responsibilities and the size of the operations.

[14] Except for premiums paid during times of labor shortage and premiums paid on outlying or inconveniently located jobs.

[15] The legality of these premiums under existing labor legislation is not entirely clear at present.

A general foreman or superintendent for a general contractor is responsible for the entire job. He directs the work of the general contractor's men, ordinarily doing so through the gang foremen, and coordinates the work of the various subcontractors' crews. He has no authority over the subcontractors' foremen and gives them information and comments (his interpretation of drawings affecting their work, the general progress schedule laid out, conformity of their work to his own or to that of other subcontractors, etc.) but not direct orders. Disagreements which cannot be settled directly are referred to the respective contractors. A general foreman of this type is ordinarily a bricklayer or carpenter by trade. A superintendent is commonly a bricklayer or carpenter but on very large jobs is likely to be a civil engineer, an architect, or a man with administrative background.

In the special trades (plumbing, electrical work, painting, etc.) general foremen and superintendents are less common than in general contracting. They are responsible only for the work of their own trades and for its direct relation to other work. These men are employed only by the largest of the special trade contractors. In some cases such a man works on an unusually large job, where he is in charge of all of his employers' gang foremen; in other cases he is in charge of a number of jobs, calling at each daily to review progress, any problems that have risen, expected material and equipment needs, etc.

It is possible for a workman to become a contractor, and many thousands have done so. Sound journeyman knowledge is a great help, but ability to plan work, to foresee needs and problems, to direct others, and to estimate material and time requirements for jobs on which he is preparing bids are much more useful than unusual craftsmanship skill. Annual earnings vary greatly with a number of factors—capital, the current volume of building (which affects both the volume of business available and the profit margin which can be included realistically in bids), ability to plan and direct field work, and business ability. The common belief that contracting is a sure, rapid path to wealth is exaggerated, to say the least. In 1939, 39 percent of all general building contractors performed work valued at less than $10,000 and more than 32 percent performed work valued at $10,000 up to $25,000; among special trade contractors, almost 78 percent performed work valued at less than $10,000, and 14 percent performed work valued at $10,000 up to $25,000.[16] Obviously most of these small contractors must have had comparatively modest earnings; probably earnings for many were less than would have been provided by full-time employment as foremen or even as journeymen at their respective trades.

Award of contracts on the basis of competitive bidding, moderately low requirements for fixed capital, liberal credit arrangements for material purchases, and the possibility of conducting a fairly substantial business from the properietor's home, all combine to make it easier to enter small-scale contracting than many other lines of business. These same conditions mean that there are many firms capable of doing small jobs, so that under normal conditions competition is quite active. Expansion to larger jobs brings the requirement for more equipment[17]; in some cases, for a separate office; in some kinds of contracting, for a real shop or a storage yard for job machinery and equipment when not in use; and for larger liquid capital. Resources, financial responsibility, and a record of satisfactory performance on previous contracts are considered in the award of large contracts and contracts for high-quality work to a greater extent than in the past. Hence, even a man of uncommon ability must expect that a period of several years will elapse before he becomes one of the recognized contractors for such jobs, unless at the time of starting his business he has substantial capital and a notably good reputation.

In some cases a contractor must have a State or municipal license, or both, and cannot legally work on his own account until the license is obtained. This is standard for plumbing and for electric wiring but infrequent for other trades. Getting a license is the first step in establish-

[16] 16th Census: Census of Business, vol. IV: Construction: table 5-A, p. 53. Value of work performed means work carried out during the year with their own employees, rather than total contracts received or completed during the year; it excludes the value of those parts of the work sublet to others. Many of the smallest of the contractors might perhaps have been regarded as self-employed workmen.

[17] Construction machinery and equipment of almost every kind can be rented, but rental is considered by many contractors to be advisable only for those items needed infrequently.

ment of a business, under all circumstances where licensing is required. Usually there are periodical examinations by a licensing board, and often a stated period of experience as a journeyman is required for eligibility, although in some cases other experience or advanced technical training is acceptable.

In some trades and localities, collective agreements provide that employers shall not work with tools. Such provision is not a restriction to moderately large and large contractors, whose time would be given to management duties in any case, but make it more difficult for a journeyman or foreman to enter contracting. He must have more capital than would otherwise be needed because of a larger weekly payroll and must also have a larger volume of business at the outset to meet his own living expenses when he has no earnings as a part-time working foreman.

Many small contractors act as working foreman on their jobs, doing as much as possible of their other work (soliciting orders and contracts, preparing bids, keeping books, deciding on orders for materials, etc.) in the evenings. This is a wearing schedule, its advantage being reduction of expenses when the business is small and capital is limited. Its disadvantage is that management duties may receive insufficient careful thought. For small-scale contracting, with perhaps no more than half a dozen employees, management duties are usually considerably less than a full-time job, but considerably more than can be handled successfully on a spare-time basis. The expense of taking sufficient time during regular working hours for at least a part of the planning of operations, careful scheduling of material requirements, negotiations with material dealers and others, etc., is likely to be less than losses resulting from errors and neglect when these are compressed into evenings following full days of hard work.

Opportunities for Minority Groups

Opportunities in the building trades for minority groups (principally Negroes) vary greatly among trades and among localities. On the whole they are best in plastering and bricklaying and poorest in the mechanical trades (electrical work, plumbing, pipe fitting). The geographical differences are local rather than regional, with Negro workmen in several trades fully accepted in some of the southern cities.

No international union in the Building Trades Department of the American Federation of Labor excludes Negroes from membership by the terms of its charter or its bylaws. However, acceptance of members is by the various locals rather than directly by the international union, and the basis for admission is established by each local for its own territory. Acceptance of applicants is frequently by vote of the current members, who are likely to be guided by local customs and attitudes. Hence, Negroes can be effectively excluded from membership or given membership subject to serious limitations (such as restriction of employment to a designated geographical area within the local's territory) without any official bylaw or regulation on the part of the local. Exclusion from union membership is obviously a severe handicap in any area where most of the new construction is done under union conditions.

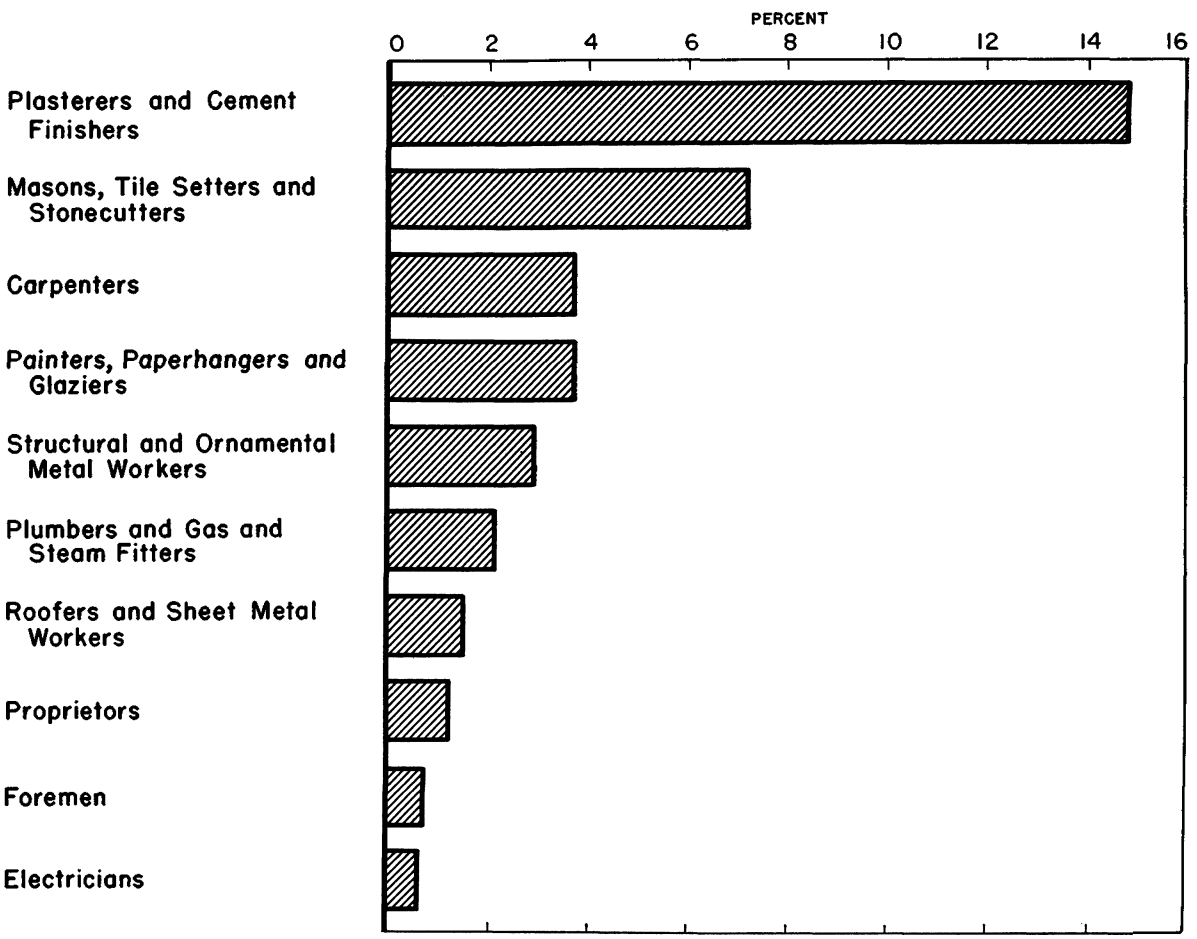
Training for any of the skilled trades means employment as an apprentice—which means getting a job, as well as being accepted by the joint apprenticeship committee for the trade and locality. Getting a job in turn is dependent on the acceptance of Negroes by employers. While there are several thousand Negro contractors, most of them are comparatively small in volume of business and thus unable to offer the regularity and variety of work meeting standard apprenticeship requirements.

There are some indications that the long-time trend is toward increased acceptance of Negroes in all of the building trades, although this trend cannot be regarded as unmistakably clear. Even if present, such a trend is unlikely to proceed without interruptions or even temporary reversals in some localities. At best it is likely to be slow, and full acceptance of Negroes for all trades in all localities cannot be expected for a period of years, at least.

Meanwhile, those accepted for formal apprenticeship have no serious employment hurdles ahead of them; this acceptance is also acceptance into the recognized labor force for their trades. Others wishing to enter the building trades will, in some cases, be able to do so through the informal methods described in the section "Training for the Skilled Trades."

Despite the serious drawbacks of these other methods, they can be advantageous for persons who have the necessary aptitudes and who are also restricted in employment opportunities in other industries as well as construction.

CHART 7



Hours and Earnings

Hourly wage rates in the construction trades are high as compared to hourly rates in most other occupations requiring comparable skill. Average hourly earnings (gross earnings, divided by the number of hours worked) have traditionally been higher in contract building construction than in other industries but currently differ comparatively little from those in coal mining, petroleum drilling and refining, and newspaper publishing. Annual earnings, however, have been below those for many industries with lower hourly wage rates but more regular employment, and have varied more greatly than annual earnings in most industries because of the great variation in the rate of construction activity.

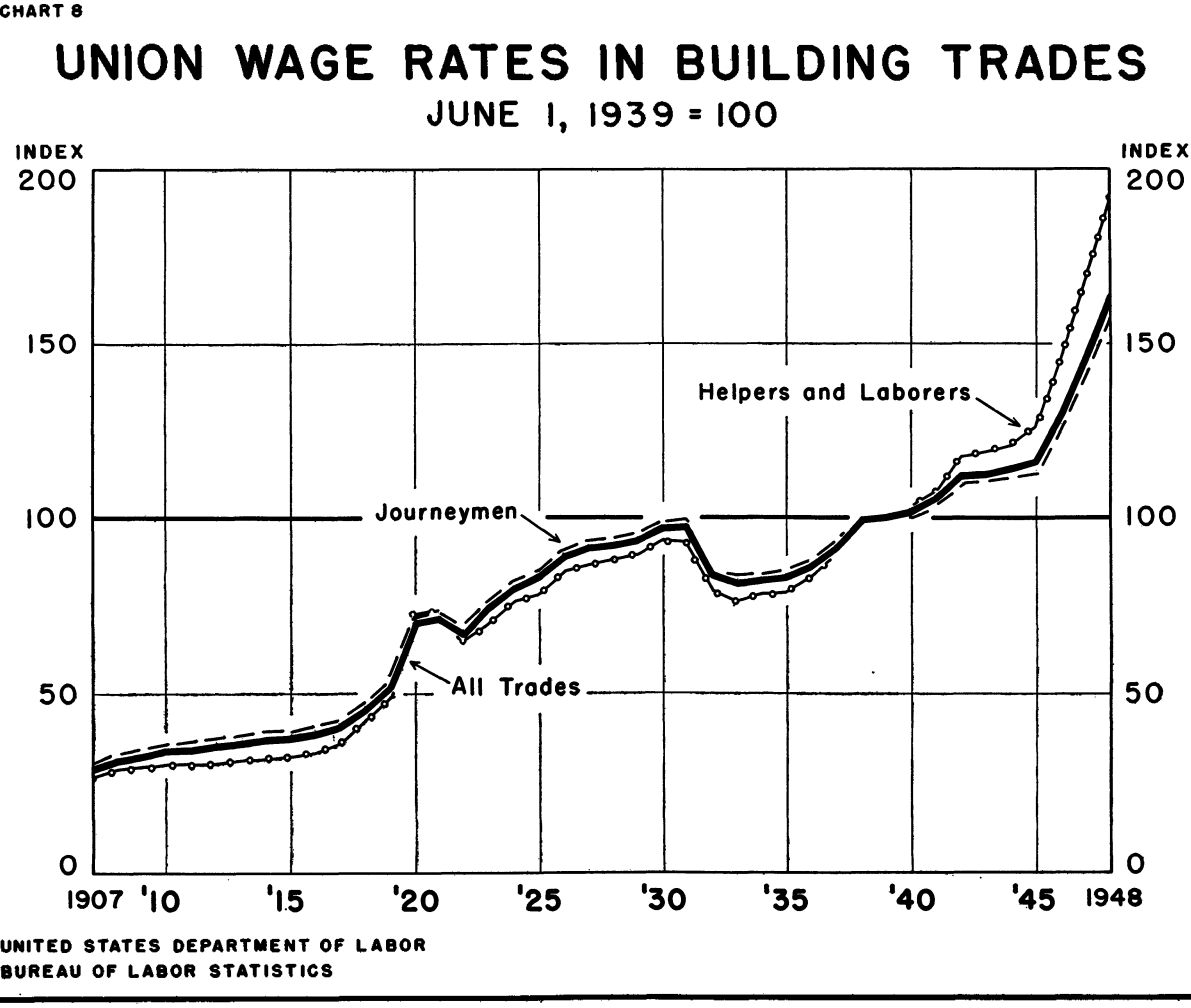
Hourly wage rates in a number of large and moderately large cities are given in the sections on the individual trades. It must be

recognized that these rates do not apply to all construction workers. In smaller cities and particularly in rural areas distant from metropolitan centers, the rates are ordinarily lower. Rates for maintenance journeymen employed in other industries are in most cases below the established scales for the construction industry. Even for new construction in the leading metropolitan centers, hourly wages rates can be misleading. An established scale of $2.50 per hour for a trade seldom means earnings of $100 per week throughout the year. For many workers there are likely to be weeks in winter with no work and no earnings, and weeks at all times of year with lost time and corresponding reduction of earnings because of bad weather, lay-offs, sickness, and numerous other reasons.

At the present time, union wage rates may be regarded as base rates in their localities for journeymen who are not union members as well as for those who are. Where shortages exist for a given trade, premiums above base rate are likely to be common—their frequency and extent depending on the degree of the shortage. Shortages are likewise accompanied by overtime work at premium rates, partly to increase hours worked and partly to attract additional workers through high weekly earnings.

Generally similar conditions have prevailed during earlier periods of labor shortage, but not at other times; they give an exaggerated picture of the earnings that can be expected. Premiums disappear at once when a labor shortage is overcome, except for jobs at most inconvenient locations and for workers having special qualifications; for these latter, the premiums are to retain them because of their individual abilities, rather than merely as additional journeymen. Overtime is limited to work which

CHART 8



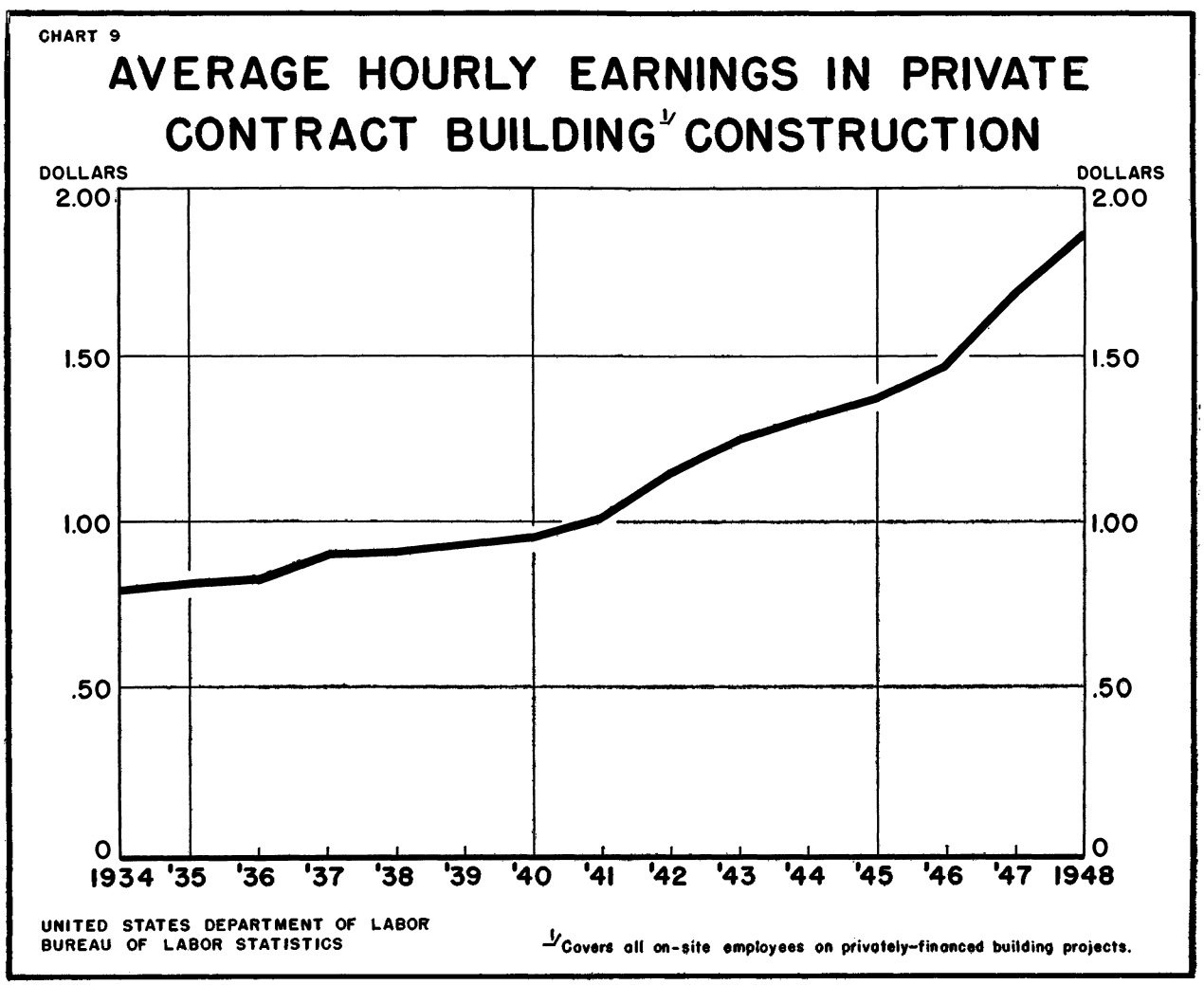
cannot be done during the standard working hours and disappears as a means of competing for workers or of increasing the total hours worked.

As long as there is a tight labor situation during the active construction season from the middle of spring until late fall, the established union rates are likely to be the minimum hourly rates for all workers on new construction. This condition has not always been present in the past and cannot be predicted with certainty for the future, although in some localities for many years all new construction, except the most trivial, has been performed by union members at the officially established wage scales. In other localities new construction was divided into two classes of work. One class consisted of all nonresidential buildings of any importance, fire-resistive (elevator-type) apartment buildings and certain types of other construction such as underground utility work; such work was done by union workmen at union wage rates. The other class was houses, "walk-up" apartments and small nonresidential buildings (one-story neighborhood stores, etc.), built by other workmen at rates commonly about a third below the union scale.

No forecast is offered of which of these conditions will predominate 10 years from now. The answer in any given locality will rest on local conditions, subject to whatever pertinent legislation may be in effect at the time. It is merely pointed out that in many localities the present situation differs materially from that which prevailed a few years ago and, hence, that its permanence cannot be assumed offhand.

Table 7 shows average hourly earnings, average weekly earnings, and average hours worked per week, for all site workers in private contract building construction from 1934 through

CHART 9



1948. The earnings figures are for workers of all occupations and degrees of skill combined, employed by general contractors, builders, and special trade contractors. Hence they show the trend in earnings but not the actual earnings for any specified locality or occupation. The average hourly earnings figures are gross earnings of all workers on the payroll, divided by total hours worked. Since they include overtime premiums and premiums paid for all other reasons, they are higher than average wage rates for all site employees.

It will be noted that average hourly earnings in the summer and fall of 1948 were about twice the figure for 1939. The most rapid increase occurred since the beginning of 1946, and it seems rather likely that further increases will occur. When the physical rate of construction ceases to expand, overtime and other premiums will be less important, with a downward effect on average hourly earnings, but it seems likely that periodical increases in hourly wage rates will continue to occur as long as there is an active construction market.

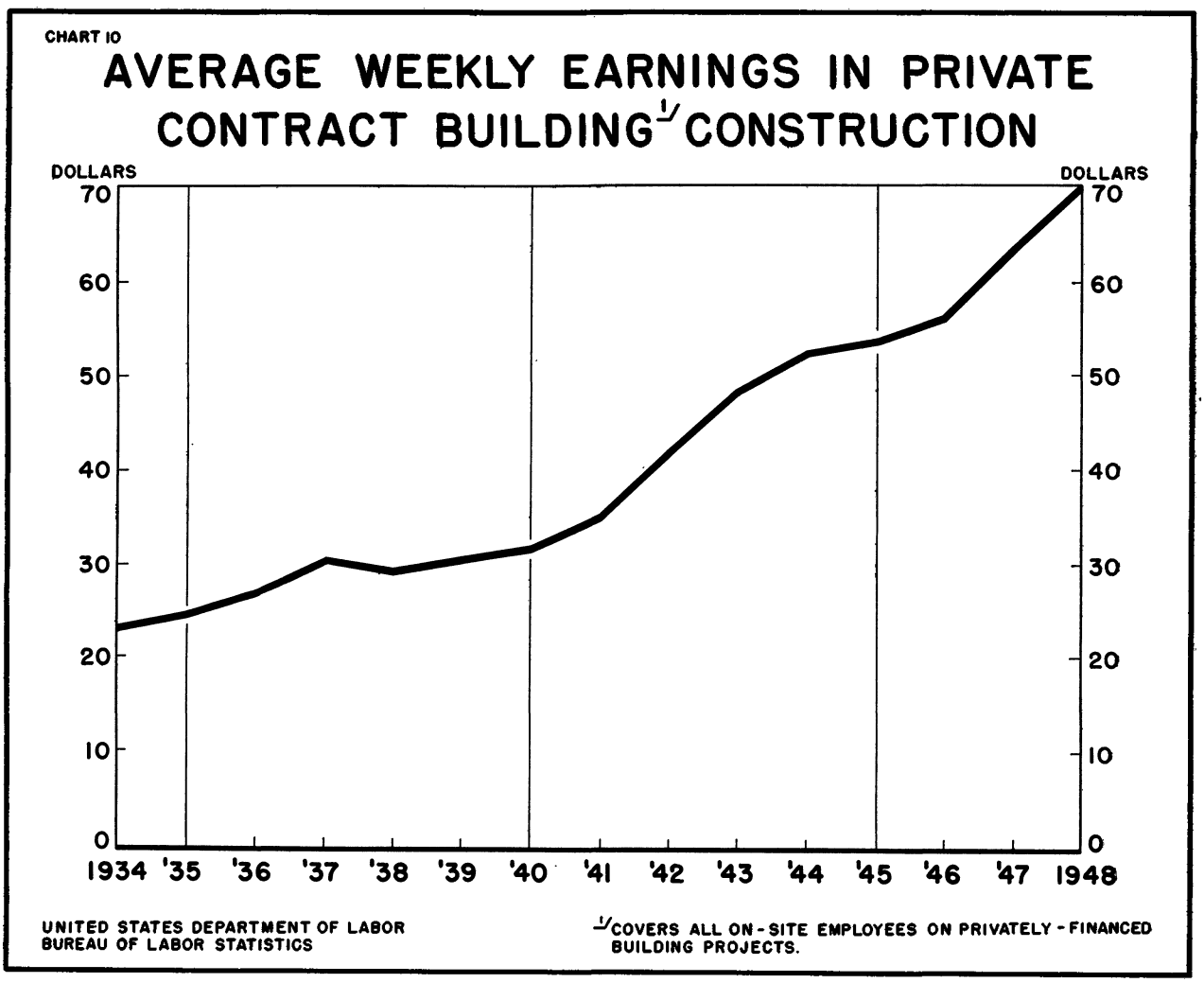


Table 7.—*Average hourly and weekly earnings and average weekly hours in private contract building construction, 1934-48*

Period	Average		
	Hourly earnings	Hours per week	Weekly earnings
1934, annual average	$0.795	28.9	$22.97
1935	.815	30.1	24.51
1936	.824	32.8	27.01
1937	.903	33.4	30.14
1938	.908	32.1	29.19
1939	.932	32.6	30.39
1940	.958	33.1	31.70
1941	1.010	34.8	35.14
1942	1.148	36.4	41.80
1943	1.252	38.4	48.13
1944	1.319	39.6	52.18
1945, annual average	1.379	39.0	53.73
March	1.363	40.0	54.49
June	1.374	40.4	55.50
September	1.388	38.1	52.94
December	1.395	37.1	51.79
1946, annual average	1.478	38.1	56.24
March	1.411	37.5	52.87
June	1.444	38.2	55.23
September	1.510	38.7	58.49
December	1.569	38.4	60.32
1947, annual average	1.681	37.6	63.30
March	1.610	38.0	61.23
June	1.661	37.8	62.71
September	1.723	37.9	65.36
December	1.774	37.9	67.31
1948, annual average	1.869	37.3	69.79
March	1.805	37.1	66.89
June	1.858	37.9	70.49
September	1.919	37.5	72.06
December	1.946	37.8	73.44

Source: U. S. Bureau of Labor Statistics.

NOTE: A revised series of estimates of average hourly and weekly earnings and average weekly hours is available, starting with January 1948. The revised series is not comparable with that shown above, and the 1948 figures differ slightly from those shown, principally because of inclusion in the new series of publicly financed projects and some types of shop workers.

It should be noted that the earnings figures are only for those workers who were employed by contractors at the various periods shown in the table and not for the entire construction labor force. The other workers had no earnings from the contract construction industry, although of course some of them were employed by other industries in maintenance or in force-account construction, some were self-employed and some were no doubt employed in nonconstruction activities.

Table 8 shows average hourly and average weekly earnings of site workers in September 1948 by type of employing contractor. In each case the figures are for all site employees—foremen, journeymen, apprentices, helpers or tenders, laborers, and any others. Both hourly and weekly earnings are higher for special trade contractors as a whole than for general building contractors, in part because of high hourly rates in the special trades and in part because journeymen and foremen make up a larger part of all site workers.

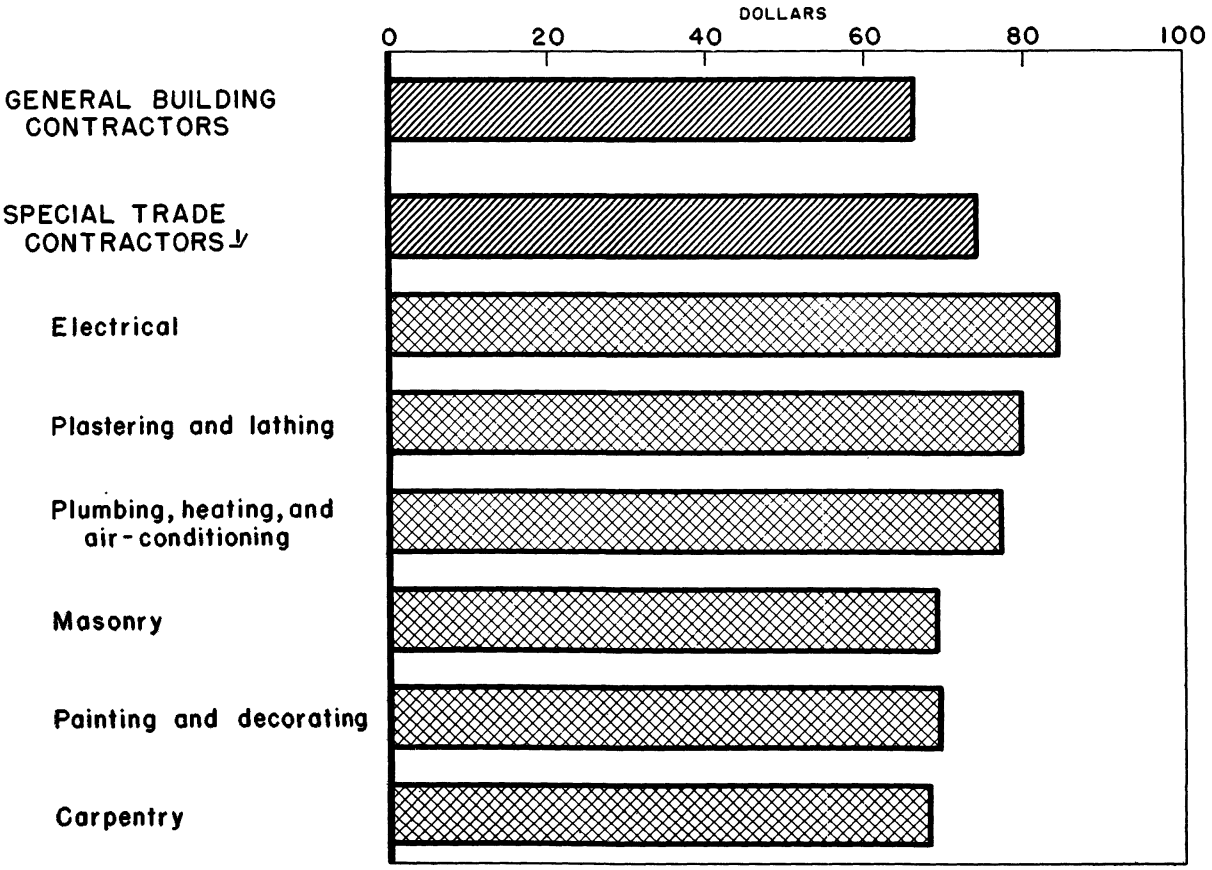
Weekly earnings were highest in electrical work, although hourly earnings were below those for plastering and lathing because of a longer average workweek. For plastering and lathing and also for masonry, journeymen's earnings were substantially higher than the figures of the table because these include the earnings of hodcarriers working with the plasterers and bricklayers. Three of the types of contracting shown (electrical; painting, and decorating; and plumbing, heating, and air conditioning) are predominantly fields for journeymen, so that the earnings shown are closer approximations to journeymen's earnings than are earnings in the other types of contracting.

With respect to union wage rates, comparisons over a lengthy period tend to be misleading beause they do not reflect the varying degree to which these rates have been effective. This qualification should be kept in mind in consideration of table 9. This table, showing wage rates as percentages of corresponding rates paid in 1939, indicates that since that year there has been an unmistakable reduction in the gap between rates for journeymen and those for helpers, tenders, and laborers. The reduction has probably been greater than indicated by the table, because, prior to the war, wage rates below union scales were probably commoner for semiskilled and unskilled workers than for journeymen.

CHART 11

AVERAGE WEEKLY EARNINGS FOR EMPLOYEES OF SELECTED TYPES OF CONTRACTORS

1948



UNITED STATES DEPARTMENT OF LABOR
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1/ INCLUDES TYPES NOT SHOWN SEPARATELY

No extensive comparison of hourly wage rates among the trades is presented, because it would have limited usefulness and would be subject to rather serious misunderstanding. On the whole, bricklayers have the highest hourly rates, but because their work is so subject to weather interruptions, they are probably surpassed in annual earnings by several other trades. Hourly wage rates for electricians are, in many localities, below those of a number of other trades, but their annual earnings are probably the highest of any of the large trades.[18] Similar considerations affect the significance of the rates for other trades. Furthermore there is no assurance that the present relationships among trades in this respect are permanent.

The differences in hourly rates are at most of minor importance in the choice of a trade, however. A young man choosing a trade for which he has little aptitude, merely because of a high wage scale, in preference to a trade with a lower scale for which he is well suited, is likely to find even the financial reward disappointing. He is likely to become only a passable good journeyman, hired by contractors for

[18] There are no data on annual earnings by occupation; the statements on annual earnings of bricklayers and electricians are expressed as opinions, based on the conditions under which the work of these trades is done and on other relevant considerations.

their peak requirements and laid off whenever a peak is over.

The picture has been considerably less favorable from the standpoint of annual earnings than of hourly or weekly earnings. Annual earnings in the construction industry as a whole and in about 80 other industries and industry groups have been estimated by the Commerce Department for 1929 through 1947. A part of these estimates is presented in table 10. It will be noted that earnings in construction were higher than in the other groups shown in the table in only three of the 19 years covered—1929, 1942, and 1943. From 1931 through 1941, earnings were lower than in the manufacturing group, which includes a number of low-wage industries as well as the high-wage industries producing durable goods. For 1931 through 1936 and also for 1938 and 1939, construction earnings were lower than earnings for "all

Table 8.—*Average hourly and weekly earnings in private contract building construction by type of contractor, December 1948*

Type of Contractor	Average weekly earnings	Average hourly earnings
All types of building contractors	$73.44	$1.946
General building contractors	70.47	1.884
Special trade contractors	77.41	2.025
Plumbing, heating and air conditioning	81.74	2.026
Painting and decorating	71.73	2.011
Electrical	89.47	2.207
Masonry	71.12	2.019
Plastering and lathing	81.52	2.291
Carpentering	68.59	1.856
Roofing and sheet-metal	64.80	1.778
Excavating, foundation, grading	66.43	1.767

Source: U. S. Bureau of Labor Statistics.

NOTE: The estimates of this table correspond to those of table 7, rather than to the revised estimates which include workers on publicly financed construction.

Table 9.—*Index of union hourly wage rates in all building trades, 1907-48*

[June 1, 1939=100]

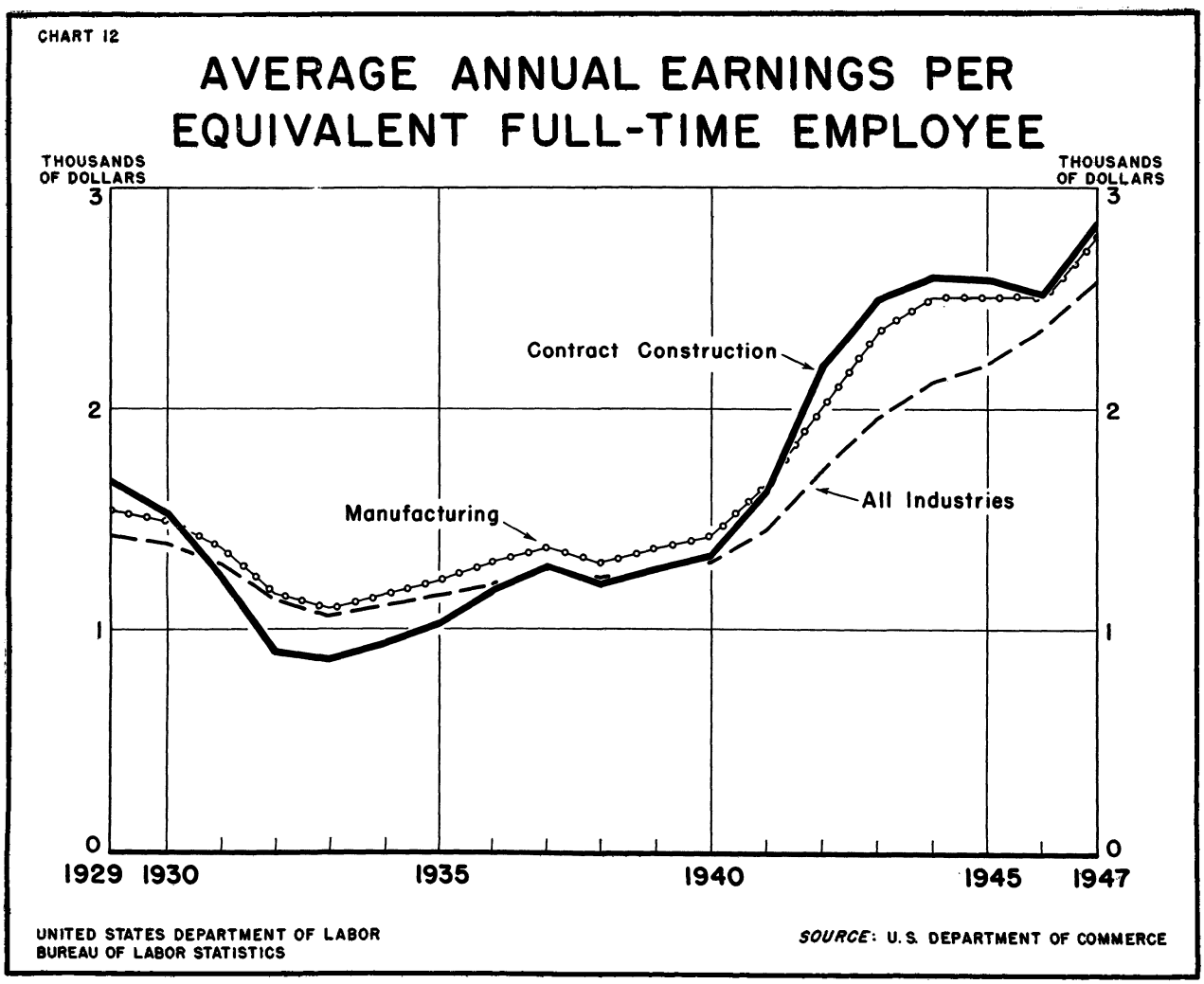
Year	All trades	Journeymen	Helpers and laborers
1907	29.3	29.7	27.3
1908	31.2	31.6	28.5
1909	32.7	33.2	29.5
1910	34.0	34.6	30.5
1911	34.5	35.2	30.6
1912	35.3	36.0	30.9
1913	36.1	36.9	31.8
1914	36.9	37.7	32.1
1915	37.2	38.0	32.4
1916	38.4	39.3	33.5
1917	40.8	41.5	36.8
1918	45.3	45.9	42.6
1919	51.9	52.4	49.3
1920	70.0	70.1	71.5
1921	71.3	71.4	72.2
1922	66.9	67.3	65.7
1923	73.9	74.2	69.7
1924	79.8	80.1	75.4
1925	82.9	83.1	77.9
1926	88.3	88.7	84.9
1927	91.3	91.7	86.4
1928	91.9	92.4	87.3
1929	93.1	93.6	88.8
1930	97.0	97.5	93.3
1931	97.3	97.8	92.8
1932	83.1	83.6	79.2
1933	80.8	81.4	75.7
1934	81.4	81.8	77.9
1935	82.3	82.8	78.3
1936	85.3	85.5	82.9
1937	91.2	91.4	90.1
1938	99.3	99.3	99.2
1939	100.0	100.0	100.0
1940	101.6	101.4	102.0
1941	105.3	105.0	106.8
1942	111.9	110.9	117.5
1943	112.7	111.5	118.9
1944	113.6	112.4	120.3
1945	116.0	114.4	125.9
1946	129.3	126.8	146.3
1947	147.9	144.6	171.1
1948	163.5	159.4	192.7

Source: 1907-'47, U. S. Department of Labor, Bureau of Labor Statistics Bulletin No. 930, Union Wages and Hours: Building Trades, July 1, 1947, table 1. 1948 indexes, Monthly Labor Review, January 1949, Building Trades: Union Wage Scales in 1948, table 1.

industries," which includes the traditionally low-wage field of farm employment and several low-wage service industries. In fact, average annual earnings in 1933 and 1934 were lower for construction than for Federal work relief. The drop of about 48 percent in annual earnings from 1929 to 1933 is greater than that for any other industry or industry group for which these estimates were made. As mentioned previously, it scarcely seems possible that any future drop in construction activity will be allowed to become an almost total collapse such as occurred from 1928 to 1933; but it is inescapable that annual earnings are more dependent on a substantial degree of general prosperity than is the case in most other industries.

The estimates shown are for the entire construction industry including office and shop workers as well as workers of all classifications at the construction jobs themselves. Average earnings for journeymen are above the figures for the various years, and average earnings are still higher for journeymen in moderately large and large cities, including their surrounding suburbs, in the north and on the Pacific coast. Earnings in 1948 were substantially higher than in 1947 for many construction workers because of a greater physical volume of construction combined with generally higher basic wage rates; for the industry as a whole, however, the difference between the two years was probably quite moderate because of less extensive labor shortages with corresponding reduction in premiums and a greater seasonal reduction in activity during the closing months of the year.

CHART 12



UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

SOURCE: U.S. DEPARTMENT OF COMMERCE

Table 10.—*Average annual earnings per full-time employee for certain industries, 1929-47*

Year	All Industries	Contract Construction	Communication and public utilities	Manufacturing	Mining	Transportation
1929	$1,421	$1,674	$1,474	$1,543	$1,526	$1,642
1930	1,380	1,526	1,497	1,488	1,424	1,610
1931	1,292	1,233	1,514	1,369	1,221	1,549
1932	1,136	907	1,438	1,150	1,016	1,373
1933	1,064	869	1,351	1,086	990	1,334
1934	1,109	942	1,426	1,153	1,108	1,393
1935	1,153	1,027	1,486	1,216	1,154	1,492
1936	1,199	1,178	1,522	1,287	1,263	1,582
1937	1,270	1,278	1,601	1,376	1,366	1,644
1938	1,238	1,193	1,674	1,296	1,282	1,676
1939	1,269	1,268	1,692	1,363	1,367	1,723
1940	1,306	1,330	1,718	1,432	1,388	1,754
1941	1,450	1,638	1,766	1,653	1,579	1,888
1942	1,719	2,194	1,881	2,023	1,795	2,181
1943	1,966	2,505	2,075	2,350	2,160	2,491
1944	2,121	2,603	2,248	2,517	2,499	2,678
1945	2,204	2,599	2,425	2,517	2,621	2,734
1946	2,365	2,539	2,566	2,512	2,723	2,949
1947	2,595	2,840	2,797	2,795	3,112	3,149

Source: U. S. Department of Commerce, Survey of Current Business, July 1948 issue, table 26, and July 1947 National Income Supplement, table 26.

Classes or Grades of Workers

Cutting across the entire construction field are the three classes of workers by whom construction is performed: journeymen; tenders and other semiskilled workers; and laborers. While in some respects foremen and apprentices can each be regarded as a separate class, both are grouped with journeymen in most parts of this bulletin because of very great similarities in many important features of their work. Their distinguishing characteristics are stated below for the building trades as a whole rather than separately for the individual trades.

Journeymen

By far the most important class is that of journeymen or skilled workers. These are the men who operate tools and machines and who process and install materials. As already mentioned, they are divided among numerous trades, each having a designated field in the over-all construction operation. The trades differ among themselves in the required skills, knowledge of materials, and knowledge of design or lay out. They are alike, however, in that in each case the standard of competence is ability to perform all types of work within the range of the trade, good working knowledge of all of its materials and how they are used, and understanding of the principles on which the work of the trade is based. Some journeymen are naturally more capable than others, and in most construction trades, as in other occupations, there are difficult or uncommon jobs for which journeymen with unusual dexterity or long experience are preferred.

While the kinds of work differ among the separate trades, most of them require a similar degree of skill. Laying out the framing members for a dormer window in a roof is quite different from laying out the plumbing system for a house, but they call for the same general kind and degree of ability. Each job requires knowledge of the assembly to be made, knowledge of the materials, and knowledge of what to do as well as how to do it. It is such knowledge, rather than merely facility in the use of tools, that marks a journeyman; skill with tools is necessary but is only part of the all-round ability required.

Foremen in any of the skilled trades are invariably journeymen who have been promoted. Most commonly a foreman is in charge only of the crew for his own trade (usually including any tenders, helpers, or laborers working with the journeymen) but not infrequently he is in charge of all of his employer's workers. Thus, either a carpenter or a bricklayer might be in charge of a general contractor's entire gang at a project where several houses are being built. On very large jobs there are frequently foremen for laborers and for some of the semiskilled occupations, but these men have a smaller range of responsibilities than do the foremen in the skilled trades. On such jobs there are commonly several foremen in the larger trades, each in charge of the members of his trade working at a particular part of the project, and there may also be subforemen ("straw bosses," "pushers"); there is also a general foreman or superintendent responsible for the coordination of all work, who usually delegates direct supervision of the journeymen to the gang foremen.

Foremen are responsible for planning the work in their respective trades, at least broadly if not in detail, and for seeing that it is carried out correctly and quickly. They call attention to any unusual requirements or situations needing special attention; arrange for delivery of materials as needed; hire, lay off, and discharge workers; represent the contractor in dealings with other contractors or their foremen, the owner, and the architect; interpret the drawings, if these are not entirely clear, or else obtain an interpretation from the contractor or the architect; and keep pay-roll records and records of material deliveries, unless the job is large enough to have a timekeeper. In most localities small jobs are run by "working foremen" who work at their trades along with members of their own crews except when engaged in supervisory or management duties, while on large jobs the foremen do no actual production work. The general contractor's foreman, whether a working foreman in charge of three or four men or a general foreman directing several hundred men through trade foremen and sub-foremen, is responsible for coordination of the work of all contractors on the job but has definite authority over the employees of the general contractor only.

Apprentices are, of course, journeymen in training. Early in the apprenticeship period they do only the simpler work of the trade while starting to build up their familiarity with tools, materials, and principles and, at this stage, work under rather close supervision. As the apprenticeship progresses, they do a wider range of work under decreasing supervision but with explanation of new situations and, in the final months, they are capable of a range of work approaching that of journeymen.

Semiskilled workers

Semiskilled workers may be divided into three classes: Tenders, helpers, and truck drivers. No formal training is required for any of these.

Tenders work with the trowel trades—bricklayers, stone setters, plasterers, marble setters, tile setters, terrazzo workers.[19] Unlike an apprentice, a tender is not a learner in the trade. The tenders do not use tools and have no chance to learn the work of the journeymen, except what they can pick up by watching them. In general, they prepare mortar or plaster, supply the journeymen with materials, set up and move portable scaffolding, clean or polish some types of completed work, and remove debris.

Helpers, as distinct from tenders, use the commoner tools and perform the simpler operations of a trade and in some cases become journeymen in their own right. They are fully recognized in only two trades, elevator construction for which there is no apprenticeship, and boilermaking as entered through construction work.[20] In both of these cases the helpers may be regarded as informal apprentices, without provision for graduation from helper to journeyman at any stipulated date. Helpers have been employed from time to time in numerous other trades—carpentry, painting, electric wiring, sheet metal work, plumbing, and steamfitting. In some localities such helpers have been employed in fairly large numbers, and some of them have learned enough to become accepted as journeymen. For some years, however, they have not been recognized in collective agreements, and have been employable only on jobs not covered by such agreements. Their status is thus quite risky, and their opportunity to acquire real knowledge and skill in their occupations is ordinarily much inferior to that offered through apprenticeship.

The duties of truck drivers in construction work are not basically different from the duties of truck drivers in other industries and cannot be regarded as constituting a separate occupation. Rather, they are merely those truck drivers who at a given time are employed by construction firms.

Laborers

Laborers are the workers doing those jobs for which no formal training is necessary—loading and unloading trucks, carrying materials, moving equipment, hand excavating and backfilling, wheeling and placing of concrete, etc. In building work their employment has tended to be less regular than that of journeymen and semiskilled workers because many laboring tasks required a large gang for a short

[19] Semiskilled workers for marble, tile, and terrazzo are ordinarily called helpers, but their duties are essentially those of tenders rather than those of helpers as described in the paragraph below.

[20] In construction boilermaking, helpers showing sufficient aptitude are recognized by the union as being engaged in learning the trade, although their employment status remains that of a helper until they are able to demonstrate a journeyman level of knowledge and competence; helpers are also recognized in shop boilermaking, but here their status as semiskilled workers is permanent, and journeyman status is attained through apprenticeship.

time—in some cases, for only a few hours; in non-building work their employment has been more regular. The trend in employment opportunities for laborers has been downward in building work and seems likely to continue so. The use of machinery has grown steadily for several important kinds of work done by laborers, and future development of machinery, new types of models intended especially for small projects, has been pursued actively by many manufacturers.

A few types of laboring work are generally treated as semiskilled and have corresponding wage rates because of hazards, discomforts or the requirement of particular familiarity with working conditions. One such type is underground excavating under air pressure for tunnels, subways, some types of deep foundations, etc. Another is demolition of old buildings, where experience and familiarity with the risks present are necessary for at least most of the members of any gang so that workers inexperienced in this hazardous activity can be assigned to the less dangerous tasks. Experience as a laborer is the usual background for entering some of the semiskilled occupations such as bricklayers' or plasterers' tender.

Trades as the Basis of Construction Work

Any construction work except the simplest uses a wide variety of materials, each with its own characteristics and each requiring appropriate tools and methods of handling. Most of these materials appear in many different types of structures, and the job of putting them in place is essentially the same. Thus brickwork is used in houses and apartment buildings, churches, hospitals, factories, in fact buildings of all types, and also in nonbuilding structures like walls or utility manholes. The operations involved in the brickwork are essentially the same for all of these structures and for many more; but in any single type of structure, such as a two-story house, the job of building the brick walls and chimney is basically different from the other jobs needing to be done.

Hence, construction operations have long been divided among a number of different trades. Some have been recognized as distinct occupations for thousands of years, while others arose fairly recently when technical developments (electric wiring, elevators, structural steel work, and power-operated construction machinery, etc.) created types of work clearly outside the fields of the older trades. Technical developments have changed the characteristics of most trades, particularly within the last 25 years, but distinct trades continue to be the basis on which construction operations are organized. The increasing complexity of buildings and the increasing range of materials and tools, combine to increase rather than diminish the necessity for division of the exceedingly wide construction field.

The field of each trade is essentially the processing and installation of a given group of related materials for any type of structure, with use of the appropriate tools and equipment. Until about 50 years ago trade distinctions along these lines were comparatively simple, but new materials and methods have made the distinctions much more complicated. Thus, the traditional materials for carpentry were rough lumber, finished lumber and millwork, plus supplementary hardware. To these have been added plywood, rigid insulating board, gypsum board, other building board, nonrigid insulation, "soft" floors (linoleum, asphalt tile, etc.), cement-asbestos shingles, and many others. Meanwhile metal products have become fairly common for uses where wood had been universal—sash and frames, doors and frames, moulding, movable partitions, floor joists, cabinets, and numerous others. Similar examples could be given for other trades.

Developments of this type have meant some degree of turbulence for construction as a whole, have changed the boundaries between trades, and have brought numerous instances of disagreement regarding the trade by which a new material was to be used. Turbulence has been present when there was no jurisdictional conflict. This is well illustrated by the methods used for fire-resistive protection of structural steel, in building construction. Steel columns and beams were covered with specially shaped tile, laid by bricklayers, for about the first quarter century of fire-resistive steel construction.[21] Then improved knowledge of con-

[21] Brick, terra cotta, and other masonry materials, which had been used for such fireproofing of cast and wrought iron as was done prior to the development of steel-frame construction, were also used but were superseded by hollow tile.

crete and improved means for its handling brought a rapid change to covering with poured concrete[22], which has been standard for about 30 years. Now a quite new method has appeared, enclosure of the steelwork with metal lath to which a new type of plaster is applied by plasterers. This use of plaster for fireproofing is particularly significant as an indication of change, because older types of plaster were used to some degree for the same purpose about 50 years ago and found to be unsatisfactory. The latest method has the great advantage of a marked saving in weight and seems likely to become a common procedure, if not the standard procedure. Yet the possibility exists that in turn it may be partially or entirely replaced in the future by a still different method.

Four skilled trades have been involved in this series of developments—bricklayers who did the tile work, carpenters who built the forms for concrete fireproofing of columns and beams, and lathers and plasterers who carry out the newest fireproofing method. All of these have been necessary trades in the construction industry throughout the period, and all would have been important regardless of whether these developments took place. There will probably be numerous comparable changes within the next generation, shifting work from one trade to another as new materials and methods come into use. For any given trade these are likely to bring some gains and some losses in employment opportunities, but the history of construction gives scant basis for fear that any of the trades will become obsolete.[23]

While distinctions between trades can be carried to extremes, their benefits are so real that on the whole they are observed as fully as is practical for the local volume of construction employment. In small communities the amount of building work seldom is sufficient to afford a reasonable income to members of the less common trades. Their types of work are done by other local journeymen, if the latter are capable of it, or else by workmen from larger cities. Thus only the commoner trades will be found in a village of 1,000 in a fairly prosperous farming area. Ordinary lathing may be done by the carpenters, ordinary glazing by the painters and often by the carpenters, and the bricklayer will do any stone setting that may be wanted; the plasterer and perhaps the bricklayer also will do cement finishing as well. More difficult and larger jobs (setting of plate glass, metal lathing for a plaster cornice or a suspended ceiling, a great number of other jobs arising infrequently in small places) will be performed by journeymen of the appropriate trades from a larger city nearby.

[22] Although concrete used for fireproofing is quite distinct from reenforced concrete, this change to fireproofing concrete for the steel work was greatly hastened by an accompanying change from flat masonry arches to reenforced concrete for the floors.

[23] The only case of obsolescence of a recognized trade was that of rubble stone masons, for which the circumstances were quite unique. This is discussed briefly on p. 9.

Training for the Skilled Trades

The accepted methods of training for practically all of the skilled building trades is through apprenticeship. This is beyond question the most satisfactory course available thus far, even though apprenticeship training programs cannot be regarded as beyond the possibility of improvement. In addition, however, many thousands of workers have become journeymen through informal training. After several years of experience as helpers, they acquired enough proficiency to meet local standards for skilled workmen. While still possible under some conditions, this path to journeyman status has many disadvantages and can lead to severe disappointment.

Apprenticeship is a period of on-the-job training in which the new worker is made familiar with the materials, tools, skills, and principles of his chosen trade so that at the end he has a balanced knowledge of the entire field and can perform any of its operations capably. Further knowledge and increased skill normally follow in the course of employment as a journeyman, but the apprenticeship gives a full, rounded background for such progress as well as for changes brought about by new materials and methods.

An apprentice is an employee—under the terms of a written agreement—working for one contractor or a series of contractors for a stated period. Under standard apprenticeship regulations, a local joint committee representing the union and the contractors for the trade at least ratifies the written agreement. Sometimes the apprentice's agreement is directly

with the committee rather than with any individual contractor. In either case, the agreement provides that the apprentice is to be employed with appropriate on-the-job instruction and adequate supervision on types of work representing the full normal range of the trade's operations.

A 4-year apprenticeship is most common, but the length of the training period varies. The minimum number of hours of work experience in each major type of work is usually specified. During this period the apprentice is paid at an advancing rate, ordinarily starting at 40 to 50 percent of the journeyman's current hourly rate and increasing at half-yearly intervals. In the final 6 months, it is usually about 90 percent of the journeyman's rate.

Rather commonly, although not invariably, advanced apprenticeship standing is given for skill acquired in the armed services and, occasionally, for skill acquired otherwise. The granting of such credit and its extent are always on an individual basis, ordinarily governed by demonstration of skill and knowledge. The credit shortens the apprenticeship period and brings an immediate increase in hourly wage rates.

For some of the trades, an apprentice ordinarily works for a single contractor throughout the entire training period but is transferred by the committee to another employer if the original contractor is unable to provide continuous employment or, because of the specialized nature of contracts he has obtained, cannot provide reasonably balanced training. In other trades, where specialization by contractors is extensive, it is customary for the joint committee to transfer apprentices at intervals of about 6 months.

As an employee, an apprentice works with the tools of the trade, doing work of progressively increasing difficulty and having progressively less supervision. It is the responsibility of the journeymen on the job and the foreman to explain to him the work being done and to show him how different operations are performed and different tools are used. The customary arrangement is that most of this instruction is given by a single journeyman to whom the apprentice is assigned at any particular time.

Under approved apprenticeship agreements an apprentice also attends school, usually 8 hours per week for 36 weeks of each year. Classes are often conducted by the Board of Education, not infrequently in consultation with the union local and ordinarily with at least endorsement by the local. In some cases the courses are conducted directly by the local. Instruction varies among trades but usually follows a general outline: History of the trade; characteristics of the materials; shop mathematics as related to the trade's work; rudiments of engineering where appropriate (particularly for pipe work, ventilating and electrical work); sketching, elementary drafting, interpretation of drawings; and special trade theory such as color harmony for painters, elementary sanitation for plumbing work, etc. In small localities, where there may be only one apprentice and half a dozen journeymen in a trade, it is seldom that either the school board or the union local is prepared to offer a course specially devised for apprentices. Here use is made of courses offered in the local high school, such as drafting and interpretation of drawings, shop mathematics, or anything else that is directly serviceable. Gaps may be made up to some degree through personal instruction by the local journeymen and contractors, or in some cases, by correspondence courses.

The kind of apprenticeship described above is provided under joint union-contractor auspices. In some trades and localities nonunion apprenticeship occurs also. Here the apprentice's agreement is with a single contractor, and there is no joint committee to supervise the training offered, to adjudicate differences, or to arrange a transfer in cases of personal incompatibility between the apprentice and the contractor. The apprentice's training depends to a high degree on the contractor's fortunes and policies. If the contractor lacks continuous work or has only a restricted type of work, he cannot give continuous, rounded training, however good his intentions may be, although he may be able to transfer or loan the apprentice to another contractor. If he looks upon apprenticeship primarily as a means of getting low-wage workers, the apprentice will probably end his course with ability to perform the commoner operations of his trade rapidly and capably but without thorough knowledge of the trade or of the theory on

which the work is based and with little experience in the less common types of work.

There is no doubt that thousands of workmen have obtained sound training in nonunion apprenticeships but the conditions present make some precautions quite important. Since there will not be the protection of a joint apprenticeship committee, before signing any agreement the apprentice should inquire carefully as to the contractor's responsibility and reputation, both for personal dealings and for reasonably good standards of workmanship. The written apprenticeship agreement should specify clearly the type and extent of training to be received, the starting wage rate, and the schedule of wage advances. Signing an agreement merely to work as an apprentice with the type of training and the schedule of wage advances not specified, involves serious risks. If the apprenticeship does not provide for classroom training, every effort should be made to obtain related instruction in a local night school or trade school or through a correspondence course. A man considering a nonunion apprenticeship should recognize that there is no assurance of his being able to acquire union membership at a later date and that lack of union membership may be a serious handicap.

Many journeymen have "picked up" their trades by working as helpers for several years, and no doubt others are doing so now. Except for elevator constructors and boilermakers, for whom this procedure is recognized, this is a most unpromising course. Under favorable conditions, including marked aptitude on the part of the worker, it can be successful; but it can also be completely unsuccessful. First, there is danger that the worker may never obtain enough skill and knowledge to rise above the status of helper or handyman. It may be possible to get work experience on only the rougher and simpler jobs, and there is, of course, no obligation to provide instruction or explanation such as those given an apprentice. Hence, night school classes or correspondence school courses are even more important than in a nonunion apprenticeship. Shifting around from one employer to another and perhaps from one locality to another may turn out to be necessary in order to obtain experience in a wide range of work and to locate employers sympathetic to the worker's efforts at self-instruction. Any family responsibilities naturally reduce such mobility and make this route to journeyman status particularly difficult. A second and quite different problem for self-trained workers is that of recognition, however capable they may become. Under some circumstances they may be accorded permanent recognition as journeymen (by union membership, or in other forms) and under other circumstances they may not. In the latter case, they will find themselves limited to employment at wages below standard, except during periods of at least mild labor shortage.

There are proprietary trade schools in some localities purporting to give training equivalent to apprenticeship in some of the building trades, within a period of a few weeks or a very few months. These schools vary considerably in the extent and quality of their instruction, but at best they cannot give work experience approaching that of even a mediocre apprenticeship. The poorest of them have been virtually worthless. Classroom training at some such schools has been quite good, and at others there has been none at all. While the pupils at some of these schools obtain training which is good as far as it goes, this is by no means a substitute for apprenticeship. Such courses have little to offer to those persons having the opportunity to enter standard apprenticeships. For persons trying to learn a trade outside of standard apprenticeship, a responsible proprietary school can give useful classroom training which might otherwise be unobtainable. Enrollment in any of the poorer schools of this class is an almost complete waste of time and money under any circumstances. A quite different type of trade school, in preparation for apprenticeship and conducted thus far for bricklaying only, is described briefly in the section on that trade.

Graduation from high school is required in some apprenticeship standards and recommended at least by implication in others. Whether required or not, it is highly desirable. While for some trades it may contribute little or nothing to manual dexterity or to familiarity with the materials,[24] it is most helpful in

[24] For example, the shop courses offered in most high schools do not deal with the materials used in bricklaying or plastering, and it is doubtful that they are of any direct help in acquiring the manual skills of these trades; but an apprentice in either trade will find a high school education of great benefit.

grasping trade theory, in understanding the relationships between the different parts of a construction job, and in preparing for any training which a journeyman may wish to take at a later time in either the technical or the business aspects of his trade. Completion of high school is especially important to one hoping to become a foreman or a contractor.

For fully a year there have been many cases in which all apprenticeship openings for a given trade in a particular locality have been filled, yet contractors have said that they needed additional skilled workers in the trade. This situation may seem to involve a contradiction, but no real contradiction is present. Beginning apprentices are very different from skilled workers; during the early training period their production can be a good bit less than the loss in production of the journeymen assigned to instruct them. Apprenticeship is a rather personal form of training, some of its stages are time-consuming to the journeymen and the foreman and expensive to the contractors, and the number of apprentices who can be absorbed at any time is limited.

It is recognized that there may be instances where the present quota of apprentices might be increased, but there can be little doubt that these are a minority; limitations on the number of apprentices have already been relaxed in a very great many cases. Quite apart from consideration on the effect of the future labor force, limitations on the number of apprentices under training at a particular time cannot be removed entirely if the type of training now given is to be continued.

The best course for those wishing to enter apprenticeship and finding that all openings are filled, is to determine their place on the waiting list and, if the waiting period is not excessive, to obtain enrollment on the waiting list and then to get as good a temporary job as possible. Members of the joint apprenticeship committee or union officials may be able to suggest spare-time study preparatory to the trade during this waiting period, which will not duplicate the classroom training to be received during apprenticeship.

PART II

THE INDIVIDUAL CONSTRUCTION TRADES

This pamphlet deals with those occupations having a large part of their employment in the construction, alteration, and repair of buildings and other structures which are ordinarily built by the contract construction industry. Thus it takes in the occupations working primarily or extensively at the construction site. Attention is given principally to the skilled occupations, with incidental attention to the others. Certain important occupations more or less closely related to construction are omitted because their work is done primarily away from the construction site or outside of the contract construction industry. The principal groups omitted are: the professions (architecture, all branches of engineering); factory occupations in the manufacture of building materials, including those where the employing firms are commonly contractors as well as manufacturers (marble sawyers and polishers, modelers and casters in ornamental plaster shops, several others); and occupations (high-tension linemen, telephone linemen, a few others) employed in types of construction carried out predominantly by other industries than the contract construction industry. Occupations employed only on large, remote, or highly specialized jobs (blacksmiths, explosives workers, numerous others) are likewise omitted.

The sections which follow describe the major construction trades—the nature of their work, trends likely to be influential, any notable characteristics of the training required, the employment outlook, earnings, and working conditions. Some trades are treated at more length than others because of greater variety or complexity in their work, a larger number of journeymen and hence greater importance from an employment standpoint, a high rate of technological development affecting their work, or for other reasons. Trades for which employment is predominantly in other industries are mentioned only briefly if at all.

As already stated, each trade is centered around a broad class of materials or a broad group of skills. Specialization is common within the more inclusive trades, but this is overwhelmingly a matter of preference and aptitude on the part of individual journeymen, and in most cases it requires at least the customary level of journeyman skill and knowledge as its background. It is true that part of the work of some trades is done by semi-journeymen able to do only repetitive and simple operations, but such workers have been declining in importance and are a very small part of the construction labor force. The specialty fields cannot be regarded as distinct occupations and are not presented separately in this bulletin; references to them, when made, are in the sections on the various recognized trades.

The descriptions of work done by the several trades are approximate and were prepared only for the purpose of giving a general picture of each of them. They are in no sense exact definitions of the field of work of any trade. For almost every trade some types of work have been omitted from the descriptions, because they are comparatively unimportant from an employment standpoint, or a clear explanation would have been unduly long, or for other reasons. Furthermore the descriptions are not completely applicable to all localities, because of local differences in customs and agreements regarding the division of work. From time to time in the past there have been transfers of specific operations or the use of specific materials from the field of one trade to that of another, and similar transfers may occur in the future.

These descriptions were prepared without regard for possible use in settlement of any jurisdictional dispute and are not valid for such a purpose. Exact jurisdictional definitions are quite outside the purpose of this bulletin; they would involve detailed, lengthy statements

quite foreign to the purposes of presenting the main characteristics and the employment prospects for the several trades. In addition, there are some zones in which differences of opinion still exist, as well as zones in which past jurisdictional decisions have not been so fully acceptable to all parties concerned that they may be regarded as final settlements.

Grouping of the occupations is complicated, and there is no arrangement regarded as standard. The commonly used term of "trowel trades" includes workers as different as bricklayers and plasterers. The term "pipe trades" covers a homogeneous group when used for skilled workers in plumbing, pipe fitting, sprinkler fitting, and refrigeration fitting, but is misleading when extended, as it sometimes is, to include electricians.

A serviceable although quite imperfect classification is into three groups: structural trades, finishing trades, and mechanical trades. Several of the trades perform work in two of these classifications. Thus many parts of the field of carpentry are unquestionably structural work—all framing operations, laying of subfloors, building of concrete forms, several other types of work. Other parts of the field are just as unquestionably finishing work—installation of millwork and finish hardware, laying of finish floors, other carpentry operations. Similar divisions occur in some of the other trades.

The recognized skilled building trades are listed below, with a brief indication of the construction work done by each. Other work is not listed, although in a few cases it provides the great bulk of the trade's employment. In each case the work includes alterations, repairs, and maintenance, as well as new construction.

Structural Trades:

Carpenters: Historically, construction operations using wood, but now including many other materials for which woodworking tools are appropriate.

Bricklayers: Walls, piers, chimneys, and other masonry units, using any material except stone or artificial stone.

Stonemasons: Setting of cut stone and artificial stone; other stone masonry.

Cement Finishers: Leveling, smoothing, and surfacing of concrete work; installation of composition floors and mastic floors; rubbing and surface-patching of concrete after removal of forms.

Structural Iron Workers: Erection of steel bridges, towers, etc.; steel frames for buildings; steel floor decking; other structural steel work in buildings and elevators.

Ornamental Iron Workers: Erection of metal stairways, fire escapes, platforms, and railings; a wide variety of work in steel and other metals.

Re-enforcing Iron Workers (Rodmen): Field fabrication and setting of steel bars and mesh for concrete re-enforcement.

Riggers: Unloading and moving into position of heavy machinery and equipment. No separate section on this trade has been prepared.

Boilermakers: Site assembly of boilers; erection of some types of tanks. This trade is employed principally in other industries than construction.

Operating Engineers: Operation of construction machinery.

Finishing Trades

Lathers: Installation of wood, metal, and gypsum lath; installation of steel channels to support lath (and certain other materials) not directly attached to structural members.

Plasterers: Application of plaster and stucco to any base; making of artificial marble and ornamental plaster in place; installation of shop-made ornamental plaster.

Marble Setters: Installation of marble except where used in block form, as a type of stonemasonry; installation of (interior) structural glass, shop-made terrazzo, and other materials used as alternates to marble.

Tile Setters: Setting of floor and wall tile.

Terrazzo Workers: Laying of terrazzo floors; installation of terrazzo base and other terrazzo, except shop-made pieces.

Painters: All exterior and interior painting; filling, staining, and varnishing of woodwork; finishing of hardwood floors.

Paperhangers: Hanging of wallpaper and other sheet material (cloth, cloth-backed wood veneer, etc.).

Soft Floor Layers: Laying of linoleum, asphalt tile, rubber tile, carpeting, and several other materials (exclusive of hardwood flooring and ceramic floor tile) for finish floors and certain other applications. This is a small occupation, recognized as a separate trade in some localities but not in others, for which a separate section has not been prepared.

Glaziers: Installation of window glass (sheet glass) and plate glass; installation of the special metalwork holding plate glass; installation of structural glass on building exteriors and of glass block in nonwatertight (interior) panels.

Roofers: Installation of roofing—slate, tile, built-up, and some other types; waterproofing and damp-proofing of wall surfaces and other surfaces.

Asbestos Workers: Installation of pipe covering and covering on boilers, tanks, industrial apparatus, etc., to reduce heat transmission; in some localities, installation of general building insulation.

Mechanical Trades

Plumbers and Pipe Fitters: Installation of systems (including piping, fixtures, boilers, and all supplementary items) for water supply, use, and drainage; for steam and hot-water heating; for piping used in industrial processes; for fire protection; for refrigeration; and for transmission of compressed air and other gases.

Electricians: Installation of electric wiring systems, including control apparatus, electric lighting fixtures, and some other types of current-using apparatus.

Sheet Metal Workers: Installation of ventilating systems (including fume-removal and dust-collecting systems, and the ventilating portion of air-conditioning systems); installation of metal roofing and siding, metal roof flashings, and gutters and downspouts for roof drainage; installation of metal partitions and certain other members made of sheet metal; installation of warm-air heating systems.

Elevator Constructors: Installation of elevators and dumbwaiters (guides, machinery, control apparatus, cars, door operators, etc.); installation of moving stairways.

There is also a brief section on building laborers (unskilled workers), with special mention of hod carriers.

A number of occupations represented in the Building Trades Department of the American Federation of Labor are omitted entirely, because their work is overwhelmingly at contractors' shops and other shops, rather than at construction projects. Among those omitted for this reason are: granite cutters; stonecutters; marble, slate, and stone polishers; marble, slate, and stone sawyers; plaster modelers, model makers, and sculptors; and iron shopmen. Truck drivers are omitted because construction affords a comparatively small part of their employment and differs only slightly from other industries in its requirements. Several very small occupations recognized as distinct trades in only a few of the largest cities are likewise omitted; these are properly specialties of larger trades, and are so regarded in all but a few localities. In general, the semiskilled occupations are omitted except for incidental discussion in the sections on the trades with which they work.

Carpenters

Outlook Summary

The outlook for carpenters is excellent for several years and should be good thereafter.

Nature of Work

Carpentry is the largest single construction trade from the standpoint of the number of workers and, in some respects, is the most extensive in the range of work done. Historically it has dealt with wood, but within recent years many other materials have been added to the carpentry field.

Most houses are of frame construction, and here the structure proper above the foundation is entirely or almost entirely the work of carpenters. Brick veneer houses, popular in many localities, are of frame construction built by carpenters, covered with an outer layer of brick. All but a few masonry houses and many other masonry buildings also use wood construction for floors, roofs, and stairs, and this too is put up by carpenters. All finish woodwork (doors, sash, surrounding trim for both, finish floors, cabinets, moldings, etc.) with supplementary hardware is carpentry. The several

kinds of acoustical materials, are in the carpentry field; so are numerous other materials which have come to prominence during the last quarter century. In many localities, the materials for general building insulation have been applied to houses by carpenters. For some purposes the newer materials (plywood, insulating board, gypsum board, hardboard, others) are used extensively, and for general insulation and acoustical treatment new types of materials are used exclusively. "Soft" floors of linoleum, asphalt tile, and several other materials are laid by carpenters in many localities.

Carpenters' work also includes a wide range of facilities used temporarily in construction operations and then removed. From an employment standpoint, the most important of these are the forms or molds into which concrete is poured for buildings, for foundations only, and for other structures, such as bridges and retaining walls. Other temporary facilities are scaffolds and platforms, towers for material hoists, safety barricades, chutes for materials and rubbish, and temporary buildings, like material or tool sheds and contractors' field offices.

A very important classification of work is repairs, alterations, and additions to existing structures. Such jobs differ greatly in extent, from replacement of a few decayed pieces in a porch to complete rearrangement of the interior of a building; they last from a few hours to several weeks or a few months.

Within recent years, modernization of old frame houses, enclosure of porches, and a wide variety of other improvements have become important as a source of employment. Carpentry is by far the most important trade in alteration and repair work, although other trades are commonly needed also and, of course, there are individual alteration jobs where carpentry is a small part of the total.

Another branch of the trade deals with heavy timbers for docks, railroad trestles, cribbing and shoring, and similar heavy construction. Strictly speaking, it is the men doing such work who are carpenters, whereas those doing ordinary building work are properly known as joiners, but this historical distinction is seldom observed.

A thoroughly trained carpenter can do all of these types of work and others not mentioned, but the field is so broad that many journeymen confine themselves to selected parts as a matter of preference whenever such work is available. Some are "trimmers," installing millwork and finish hardware; others lay hardwood floors; others prefer framing and rough carpentry; others prefer alteration and repair work or the building of forms for concrete. These subdivisions are not trades in themselves, and, for the most part, basic journeyman competence is essential for competence within the specialty. The differences between individuals in aptitudes are important in specialization. Thus, a man for whom careful, accurate workmanship is easy will usually be most advantageously employed in trimming and will usually prefer such work; a man for whom such workmanship requires special effort will be more advantageously employed at framing or other rough carpentry. There have been many illustrations, however, that capable journeymen can transfer as needed into even an uncommon specialty. Perhaps as striking as any was in the building of the "Independent" subway in New York City some years ago, carried out for several miles by excavating from the street rather than by tunneling. Many hundreds of carpenters were hired for heavy timber work to provide a temporary street surface above the excavation for vehicular traffic and to shore (i.e., brace and support) the buildings adjoining the excavation. It is exceedingly likely that many, if not most, of these men had no prior experience in heavy timber construction.

Specialization is naturally commonest in the large cities. In small communities it is unusual, because the total volume of work is insufficient. Here the carpenters ordinarily do all types of work within their trade, and in rural areas they frequently do some types of work which are performed in larger places by other trades.

Where Employed

Most carpenters work in the construction industry. A large number are self-employed on repairs, alterations, and quite small new buildings. Not uncommonly these men alternate between wage-employment for contractors and self-employment on small jobs. Some self-employed carpenters are able to expand their activity to contracting, hiring other journeymen, and perhaps awarding subcontracts, either occasionally or regularly. Many thousands of carpenters work for "home improvement" firms

on repairs, small alterations, modernization, and miscellaneous improvements. A great many carpenters are employed in other industries, on force-account new construction to some degree but on maintenance work and alterations to a much greater degree. These men are employed in factories of all types for maintenance and repairs, for small alterations, for quite small new work, such as sheds, and for building all sorts of factory equipment which is made of wood—racks, benches, wooden templates, etc. They are similarly employed as "house carpenters" in hotels, large office buildings, department stores, and other large establishments. They are employed by firms or individuals with large real estate holdings and by public bodies, such as cities and boards of education.

Construction employment is principally, although by no means entirely, in building work. Most residential building is largely carpentry. In fire-resistive buildings having no woodwork in the structure proper, there is commonly extensive finish woodwork and practically always carpentry for concrete forms. Carpentry is least important in some of the specialized industrial buildings, such as oil refineries and steel-mill buildings. In most types of nonbuilding construction, carpenters are a small minority of total workers, but this employment field is by no means negligible. They are needed for building concrete forms for dams, for bridges, for several types of sewer-and-water structures (settling tanks, for example), and in other types of construction. They are needed for cribbing and bracing, in several kinds of underground construction work. Occasionally these nonbuilding carpentry jobs are very large. Among the most striking have been trestles, some of them several miles long, to support belt conveyors from a gravel pit to a dam. There is no type of project in which carpenters are not employed to at least some degree, and few types in which there are not large carpentry projects at least occasionally.

Employment opportunities also exist entirely outside of construction. Carpenters are employed in shipbuilding, in mining, and in the production of many kinds of display materials (motion-picture sets, window display and convention display material, etc.). Building and repairing of railroad cars has declined greatly in importance because of the replacement of wood by metal, but other railroad employment (for maintenance of stations, other buildings, and other wooden structures) is of course permanent. There are many additional types of skilled factory employment, but for the most part these are for cabinetmakers or shop carpenters (millmen) rather than for construction carpenters.

Carpentry may be regarded as the basic building trade, needed in localities of all sizes. Hence, there are carpenters in rural communities too small to support journeymen in any of the other trades.

Training and Qualifications

The trade of carpentry is made up of many elements. A fully qualified man must be skillful in the use of a wide variety of tools (hand tools of many types, and also several electrically operated tools) and must know the characteristics of many materials. He should have an elementary understanding of structural design and must be thoroughly familiar with the common systems of frame construction, including the purposes of the various members and the relationships among them. He should know construction practices and standards, such as customary spacing and secure fastening of parts, and of course know the relationship between carpentry and the work of other trades. Ability to read blueprints and to compute dimensions for any part of a building are important, as well as a knowledge of simple mathematics and facility in using the "steel square."[1] Ability to work without drawings (taking measurements as needed) is usually necessary in making repairs or alterations to existing work. In some situations ability to make clear sketches of work to be done is desirable, and ability to make an accurate, detailed schedule of needed materials is quite important for any journeyman wanting to work on his own account or to become a foreman. A well-trained carpenter is a highly skilled man, altogether different from a handyman able to do only some of the simpler and easier jobs.

The customary way to become a journeyman is through a 4-year apprenticeship, which in all essentials is as described for the building trades as a whole on pages 38-41 inclusive. The

[1] A large L-shaped device for graphic computation and marking of oblique cuts to be made in lumber.

training progresses from comparatively simple jobs, such as laying subflooring, to more difficult jobs, such as laying out and cutting the members for a dormer. When his manual skill is sufficient, the apprentice works on trimming. Emphasis in the training is, of course, affected by the types of work which the employer has on hand from time to time. Most apprenticeship programs provide 144 hours of classroom work per year, covering such subjects as shop arithmetic, simple algebra, drafting and blueprint reading, and woodworking shop work.

Veterans with carpentry experience in the service may be eligible for acceptance by the union as advanced apprentices, or even as journeymen, if their experience is sufficient and they are able to pass the examination usually given by the union local on completion of apprenticeship. Provisions for such acceptance are established by each of the locals for its own territory.

Many men have learned the trade informally, working as handymen or helpers until they became sufficiently adept to be employable for more exacting work. While this method can be successful, it has many disadvantages and at best is an undependable substitute for apprenticeship.

Outlook

The outlook for carpenters is excellent at present and is likely to continue to be vary good. New materials, tools, and methods have changed the detailed operations of carpentry extensively but changed the basic nature of the work less than in several other trades, and current trends in this respect are on the whole favorable. The long-range trend is undoubtedly for higher lumber prices[2] because of several reasons, of which the most important is the Nation's diminishing supply of standing timber, with increasing necessity for cultivating and caring for trees almost as a slow-growing agricultural crop. This development is unfavorable but not too serious, even though it will probably bring a choice of masonry rather than frame construction for houses and other small buildings in some cases. Such an effect will, of course, be gradual rather than immediate or sudden. Other developments mentioned below are quite favorable for some types of nonresidential building. It must also be realized that carpenters already use a number of important products not made from wood, as well as some products that are or can be made from wood scrap, pulpwood, and other forms of wood not directly usable in construction.

The lumber and lumber products industries are fully conscious of the significance of diminishing timber stands and also of the development work being done with other materials. They have been conducting many industrial research projects to make the best use of wood, to develop new products, and to reduce mill waste, especially by developing productive uses for scrap and low-grade pieces. The U. S. Forest Service has likewise been active at the Forest Products Laboratory and elsewhere, and a number of universities and other organizations have been active as well. These efforts have increased the usefulness of wood greatly in structural elements, such as trusses, bringing use of wood trusses in numerous wide-span buildings where steel would have been used a few years earlier, and resulted in new elements laminated from wood (arches and "rigid frame" members, which in structural properties resemble arches to a considerable degree) having marked advantages for some types of buildings. A minor but noteworthy fact bearing on adjustment to decreasing timber supply and high prices is the adoption of a sheet material made from ground wood scrap and a plastic binder, for door panels and other uses, by one of the largest manufacturers of better grade stock millwork; a number of other wood products manufacturers are interested in making somewhat similar materials.

Carpentry has been affected by changed methods and changed organization of site work. Electric handsaws, introduced about 25 years ago, were used only by the larger contractors for a number of years, but within the past 10 years they have become standard in most localities. Other electric hand tools have been adopted, but less extensively. Radial saws were brought out about 10 years ago and were accepted much more rapidly on moderately large and large jobs having extensive repetition of individual pieces. Their use is accompanied by division of the construction work between a

[2] This trend is quite separate from, and also quite consistent with the short-term downward movement of lumber prices from their postwar high level, which started in late summer of 1948.

processing crew, which cuts parts to size, and an erection crew, which installs them. On some jobs the work has been divided further, with six, eight, or even more small erection crews, each doing only designated parts of the work on all buildings (usually houses) in a project. This is a basic change from traditional practice, in which one crew performed all rough carpentry operations on a single house, with several such crews working at once on different houses on a large project. This change reduces the hours of carpentry work per house under favorable conditions, but often the reduction is much less than is potentially possible because any interference with schedule can delay the entire project rather than merely one crew. The change also makes it possible for some of the operations to be done by men having less than all-round journeymen competence, but this practice has not been followed widely.

Carpentry is also the trade most directly affected by prefabrication. To date this has not reduced site employment substantially, and it seems unlikely to do so. There may very well be some degree of increase in prefabricated houses as a percentage of the total, but the increase is likely to be moderate. Capably planned and managed site construction methods have been able to compete successfully with prefabrication thus far and seem likely to continue so. They offer worthwhile advantages quite comparable to the advantages of prefabrication.

More highly processed materials and materials designed for easier and faster installation have become progressively more important. Examples are doors and sash made to exact size and hence requiring no fitting at the job, partially assembled door-frame-trim combinations, fully assembled sash-frame combinations, tubular door locks to cut down the time of installation, sash balances for quicker installation than pulleys and counterweights. From a quality standpoint, many of the more quickly installed materials are fully equal to older types of materials. Some others are not, but still are quite good enough to be suitable for most buildings. Manufacturers are, of course, strongly interested in the sales advantage of products with reduced installation cost, but this interest is not new. There is every reason to expect that development will be gradual in the future just as it has been in the past.

Carpentry is by far the largest single construction trade, although any estimate of the number of carpenters is subject to considerable uncertainty. This is a trade where census figures are probably execessive, because of reporting of handymen and other partially trained workers to the census enumerators as journeymen carpenters. The number who may reasonably be called carpenters is probably over 500,000, including many thousands who received their training informally, not all of whom are capable of doing the most exacting types of work. "Hammer and nails men," capable only of simpler and rougher types of work and having little knowledge of the reasons for what they are doing, are not included in this figure.

At the end of October 1948, there were about 42,700 carpentry apprentices known to the Bureau of Apprenticeship, plus probably a few thousand others. These figures exclude apprentices for shop carpentry and for cabinet work. On the basis of a 4-year apprenticeship, current replacement is at the rate of not over 2½ percent of the trade's present membership each year. This percentage is not sufficient to maintain the size of the trade under present-day conditions, particularly because of the average age for journeymen of probably about 53 years,[3] with correspondingly high loss rate from death and retirement. Unless the replacement rate is increased, there will be either a continued reduction in the size of the trade or entrance of many thousands of workers trained through other means than formal apprenticeship.

Wage Rates

Wage rates established by collective bargaining agreements and in effect on July 1, 1948, are given on page 49 for a number of areas. In each case the rate is for a surrounding area as well as for the city itself. These are minimum union rates for journeymen, and in some cases higher rates are scheduled for specified types of work.

In small localities wage rates are, on the

[3] The statement on average age is based on Apprentice Training Service (now Bureau of Apprenticeship) Technical Bulletin T-121, "Age Trends in the Skilled Trades in the Construction Industry, 1900-1940," which in turn is based on census data. The change in average (median) age since 1940 was estimated on the basis of conditions affecting turnover in the trade since that time.

whole, less than in the cities listed, and in rural localities they are likely to be substantially less most of the time. This difference is more important for carpentry than for some other trades because of its much wider geographical distribution. Even in many of the largest cities, there is likely to be a noticeable amount of employment below established wage rates unless in times of labor shortage, in "home improvement" work. Some of the contractors for such jobs have high standards of workmanship and pay corresponding wages, while others have much lower standards and pay wages more appropriate for helpers than for journeymen.

Area	*Hourly rate*
Atlanta, Ga.	$1.77½
Baltimore, Md.	1.95
Birmingham, Ala.	1.80
Boston, Mass.	2.10
Buffalo, N. Y.	2.25
Chicago, Ill.	2.35
Cincinnati, Ohio	2.20
Cleveland, Ohio	2.37½
Denver, Colo.	2.10
Houston, Tex.	2.00
Indianapolis, Ind.	2.17½
Jackson, Miss.	1.75
Kansas City, Mo.	2.05
Little Rock, Ark.	1.75
Los Angeles, Calif.	2.03¾
Louisville, Ky.	1.95
Milwaukee, Wis.	2.00
Minneapolis, Minn.	2.05
New Haven, Conn.	2.10
New Orleans, La.	1.75
New York, N. Y.	[1]2.75
Omaha, Nebr.	1.95
Philadelphia, Pa.	2.25
Pittsburgh, Pa.	2.50
Portland, Oreg.	1.92½
Richmond, Va.	1.80
St. Louis, Mo.	2.45
San Francisco, Calif.	2.16
Seattle, Wash.	2.06½
Springfield, Mass.	1.87½

[1] 35-hour workweek.

Additional Information

Additional information on apprenticeship may be obtained from the United Brotherhood of Carpenters and Joiners of America, Carpenters Building, Indianapolis 4, Ind., or from the Apprenticeship Committee of the Associated General Contractors, 1227 Munsey Building, Washington 4, D. C.

Bricklayers

Outlook Summary

The outlook for bricklayers is excellent at present and should be very good for several years. Thereafter openings will be primarily for replacements rather than for expansion of the trade.

Nature of Work

Bricklayers are skilled craftsmen, whose main work is the construction of walls, partitions, fireplaces, chimneys, and other parts of buildings, from brick and numerous other masonry materials. These latter include structural tile, facing tile, terra cotta, the concrete-block family (including cinder block and other lightweight blocks), gypsum block, glass block,[4] and several less common materials. In large cities, bricklayers do not set natural or artificial stone, except on jobs having only a few scattered pieces like window sills, but in small places, "combination men," doing both stonework and brickwork, are frequent. Bricklayers also build blast furnaces and coke ovens, build power-plant and industrial chimneys (which, unlike ordinary chimneys, are separate structures), install the fire-brick linings of kilns and industrial furnaces, build the brick settings for power boilers and large heating boilers, build manholes and catch basins for sewers, and build manholes, cable vaults, and tile conduit lines for underground utility cable.

Building brickwork itself covers a wide range. Exterior walls are commonly face brick on the outside backed with common brick, but the backing may be concrete or cinder block or structural tile. Walls entirely of concrete or cinder block are also common. Stone exteriors (set by stonemasons) are ordinarily backed with brick or tile by bricklayers. For houses, brick veneer is popular—this is essentially frame construction (built by carpenters) covered on the outside with a single thickness of

[4] Mainly in exterior walls; interior panels of glass block are ordinarily not weather-tight and are set by glaziers.

[5] Structural tile having one side or two sides carefully finished and free from imperfections, so that it is satisfactory for a final finish; it may be either glazed or unglazed. This is entirely distinct from wall tile (installed by tile setters rather than bricklayers), a thin material which must be fastened to a self-supporting wall or partition.

brick by bricklayers. In several types of commercial buildings, facing tile[5] has become popular for exterior and interior surfaces. In fire-resistive buildings, vertical passages (stairways, elevator shafts, etc.) are often enclosed with masonry partitions. In these buildings, the partitions between rooms (unless "solid plaster," described under plastering) consist of structural tile, facing tile, or gypsum block, laid by the bricklayers.

Bricklaying is careful, accurate work, because the inflexible materials must be made to conform to established dimensions of the building. The bricklayer or foreman computes the number of courses (layers) of brick and the corresponding thickness of the mortar joints so that the courses come out evenly with sills, the tops of windows and doors, etc., and then must keep the mortar joints close enough to this thickness so that the wall has a uniform appearance, and the courses come to the heights planned. A somewhat similar procedure for horizontal dimensions is followed so that the wall fits the dimensions between windows, between a window and a door or a corner, etc., without needless or irregular cutting of brick, which results in a messy appearance.

In laying brick or any other masonry unit, a bricklayer first spreads a layer or "bed" of soft mortar, then sets the brick onto this, and taps it with his trowel to the right position. This is placed with the middle above a vertical mortar joint of the course below. Next he cuts or scrapes off the excess mortar from the bottom joint and end joint and applies it to the exposed end or back. He keeps the courses lined up by use of a gauge line (tightly stretched cord) as a guide and from time to time checks the vertical and horizontal surfaces for trueness with a mason's level. As necessary, he cuts (breaks) bricks with his trowel to fit spaces too small for whole bricks. If the wall consists of two or more thicknesses of brick, at regular intervals he lays a "bond course" to tie thicknesses together. This usually consists of brick laid crosswise, but several other bond patterns are also used for the same purpose.

If he is working with concrete block, structural tile, or other materials, his work differs in a few details but is the same in all essentials. Likewise, on special types of construction (round industrial smokestacks, manholes, refractory lining of furnaces, etc.), there are differences in detail only from the common types by building brickwork. Bricklayers working in any of these special fields are men who entered it and became experienced in it from preference or probably accidental reasons, in many cases, and do not make up a distinct subtrade in any sense. Many of these bricklayers work on the common forms of masonry part of the time.

Where Employed

About 80 percent of the bricklayers work in the construction industry, mainly on new construction. From the nature of masonry, repair work is comparatively small, consisting largely of "pointing" of mortar joints (scraping out loose mortar near the surface and refilling the joints); buildings in need of extensive masonry repairs are usually so generally deteriorated that they are not worth the expense. There is a considerable amount of alteration work, however, especially in larger places —fire-resistive partitions to fit the requirements of new tenants in office buildings, fire walls around stairways and elsewhere in nonresidential buildings to meet new fire regulations or the regulations for a new type of occupancy, store-front and similar work in commercial modernization, residential modernization, etc. In total, these afford only a small fraction of the employment for bricklayers in the contract construction industry; the bulk of the employment on maintenance and recurring alterations (such as partition changes, made almost continuously by large real estate firms managing a number of major office buildings) is on a force-account basis.

Bricklayers are employed for maintenance work in many industries, particularly those using furnaces, kilns, and other facilities with refractory linings. Such work is extensive in glass factories, coke ovens, blast furnaces, and steel mills, and, to lesser extent, in many other industries. Bricklayers are also employed on force-account for maintenance, alterations, and (to some extent) for new construction by other organizations having extensive property —large industrial firms, railroads and other

utilities, large-scale owners or managers of investment property, Government agencies, and others.

Training and Qualifications

A bricklayer needs an eye for straight lines and proportions and a knack for using his hands. Since the other trades must usually fit their work to his, he should be able to picture how the parts of a structure fit together. A fair degree of physical endurance is necessary for handling moderately heavy material hour after hour, at some stages stooping very frequently to get material. There must also be ability to make rough sketches, to read blueprints, to make measurements, and to lay out the various parts of a building with respect to each other.

On small jobs, the bricklayer foreman is frequently in charge of all work for the general contractor, and, on large jobs, the general foreman is often a bricklayer by trade. For such employment a thorough knowledge of construction is necessary,[6] including a good working knowledge of the other trades and their requirements, real facility in reading blueprints and visualizing the work which they indicate, and ability to make all measurements for guide lines and other marks so that proper allowance is made for the space needed by each trade—and thoroughness which detects any discrepancies in the drawings at the outset, when there can be correction without changing any completed work. These abilities go beyond dexterity in handling the tools and materials.

Training is ordinarily obtained through a formal apprenticeship of 3 to 4 years, similar in all important respects to apprentice training for the other trades. In a number of areas the training program has been aided greatly by trade school courses, in manipulation of the tools and materials, conducted for a few weeks before the start of apprenticeship. These courses have been sponsored by the Structural Clay Products Institute and in each case have been given with the endorsement of locals of the bricklayers union and associations of masonry or general contractors. They are intended to give sufficient skill in handling the tools and materials so that the beginning apprentices will be useful at the very start of the on-the-job training and will also be better prepared to benefit from such training. In some cases, they result in advanced apprenticeship standing.

The apprentice training program in many cities calls for related classroom work in the history of the trade, characteristics of the materials, masonry as a structural material, the proper ways to make bonds, arches, corbels,[7] etc., making and reading working sketches, reading blueprints, making measurements and laying out work, and similar subjects. Where classroom training is not available, instruction in these subjects must be obtained at the job or through correspondence courses.

Outlook

Opportunities in bricklaying are very good indeed. There is room for expansion of the trade, and every indication that it will continue to be almost as important a part of construction work as in the past, despite continuing changes in the composition of its field of work.

Within the past 60 years, changes in bricklayers' work have been startling. When steel-frame and re-enforced concrete construction for buildings was introduced, the exterior walls no longer had to support the floors and roof and became merely a way of enclosing the building. This brought a great reduction in wall thickness for tall buildings and heavy-occupancy buildings. By concentrating the load on quite small columns, these construction systems allowed a great increase in window area, and metal sash gave a convenient means of providing almost unlimited window area. Hence, factory and warehouse walls now consist far more of windows and far less of masonry than was formerly possible. At one time, brick was used extensively for sewers and for the lining of tunnels, but it has been replaced for these uses by other materials, although it is still used for manholes and catch basins. Curved and flat arches for the load-bearing floors in fire-resistive buildings were an im-

[6] Commensurate, of course, with the size and complexity of the job; a man might be an excellent foreman for a brick house or small store building but be unsuitable as general foreman on a large, complicated building, such as a 500-bed hospital.

[7] A corbel is a masonry projection made by advancing each course from the face of the wall slightly further than the course beneath it.

portant masonry field until about a generation ago, as was masonry fireproofing of structural steel, but these have passed out of use completely. Ornamental brickwork, using specially shaped brick for relief ornamentation and, in some localities, using brick of two or more colors laid in geometrical patterns ("diaper work"), was popular a little earlier but now is exceedingly uncommon.

The trade has absorbed all of these changes, and will absorb others. A few months ago the 13-story Equitable Savings and Loan Building was completed in Portland, Oregon, with no masonry in the exterior walls above the second-floor level. This is the first multistory building in the world embodying the long-discussed proposal of making the exterior walls purely insulating enclosures, without load-bearing properties. On a long-range basis, it seems likely to exercise marked influence on design and material usage in multistory commercial buildings and structurally similar buildings, such as some types of apartment buildings. If so, this will mean a gradual reduction in the employment field for bricklayers.

A number of attempts have been made to develop factory-made chimney assemblies for houses, in place of masonry chimneys. Those used in war housing projects were seriously unsatisfactory in many cases, and at some projects expensive alterations were made to reduce the fire hazard. Presumably this experience has guided the firms offering chimney units now, and further improvements may reasonably be expected, but the risk of early obsolescence of masonry chimneys seems slight. The permanence and fire protection of a well-built masonry chimney set very high standards for other constructions intended to be equally satisfactory.

The over-all trend is by no means unfavorable, however. Fire-resistive partitions are very old but, until structural tile became readily available, were so heavy and expensive that they were used only in the most massive buildings. Now, made of comparatively light materials, they are exceedingly common, and their use is becoming gradually more widespread because of stricter fire and safety regulations. Some are made of masonry units with or without a covering of plaster, and others are "solid plaster" applied to a core of metal lath or, in some cases, a core of gypsum board. The long-range trend for lumber prices is unquestionably upward, as stated in the preceding section on carpenters, and this will tend to increase the use of masonry. A new system of dimensions ("modular coordination") for buildings and certain of their parts, including masonry units, reduces the time and cost for almost any specific job of building brickwork but, as it becomes more widely used, is likely to increase the use of masonry and masonry veneer in ordinary houses enough to bring a noticeable net increase in employment. The structural clay products industry has for some years financed a program of industrial research projects, mainly at universities having colleges of ceramic engineering, for the purpose of improving its products and methods and of developing new products and new uses. This program has already brought products tending to increase bricklayers' employment, and may be expected to bring further accomplishment. Glass block likewise has meant increased employment for bricklayers and, in combination with ventilating or air-conditioning systems, it seems likely to be used more extensively than in the past. Transparent block with smooth interior and exterior surfaces is now available, through which occupants of buildings can see the outside without objectionable distortion. This opens a new field of use.

Bricklaying is one of the fairly large trades, with current employment of roughly 100,000 in new construction, exclusive of employment (largely on a force-account basis) in maintenance. Because of the age distribution, there is probably a loss of roughly 4,000 per year from death and retirement, and an additional but very much smaller loss from transfer to other occupations, including contracting and promotional building. At the end of October 1948, there were 12,068 apprentices (including those for the combination of bricklaying with stonemasonry) known to the Bureau of Apprenticeship and an unknown but probably rather small number of others. Since the apprenticeship lasts at least 3 years and in many cases 4 years, this number is at most sufficient to maintain the size of the labor force. If maintained, it will reduce the average age in the course of time, and thereby reduce the average annual rate or death and retirement, but it

obviously offers no threat of a surplus of trained workers.

Wage Rates

Minimum wage rates for journeymen established by collective bargaining are given below for a number of areas as of July 1, 1948. In each case these rates are effective for a surrounding area as well as for the city itself.

Area	*Hourly rate*
Atlanta, Ga.	$2.25
Baltimore, Md.	2.50
Birmingham, Ala.	2.25
Boston, Mass.	2.50
Buffalo, N. Y.	2.50
Chicago, Ill.	2.40
Cincinnati, Ohio	2.50
Cleveland, Ohio	2.37½
Denver, Colo.	2.25
Houston, Tex.	2.50
Indianapolis, Ind.	2.40
Jackson, Miss.	2.25
Kansas City, Mo.	2.50
Little Rock, Ark.	2.50
Los Angeles, Calif.	2.62½
Louisville, Ky.	2.50
Milwaukee, Wis.	2.20
Minneapolis, Minn.	2.25
New Haven, Conn.	2.40
New Orleans, La.	2.05
New York, N. Y.	[1]3.20
Omaha, Nebr.	2.25
Philadelphia, Pa.	[1]2.75
Pittsburgh, Pa.	2.70
Portland, Oreg.	2.50
Richmond, Va.	2.50
St. Louis, Mo.	2.75
San Francisco, Calif.	2.81¼
Seattle, Wash.	2.36½
Springfield, Mass.	2.32½

[1] 35-hour workweek.

Annual earnings in bricklaying are lower than the hourly earnings might indicate, because of lost time and seasonal unemployment. Most jobs are outdoors and are more subject to weather interruptions than is the work of a number of other trades.

Additional Information

Additional information on apprenticeship may be obtained from the Bricklayers, Masons, and Plasterer's International Union of America, 815 Fifteenth Street, NW., Washington 5, D. C., from the Apprenticeship Committee of the Associated General Contractors, 1227 Munsey Building, Washington 4, D. C., and from the Mason Training Promotion Department of the Structural Clay Products Institute, 1520 Eighteenth Street, NW., Washington 6, D. C.

Stonemasons

Outlook Summary

The outlook for stonemasons is good at present but on a long-range basis is only fair. This trade is employed mainly on rather specialized types of construction, and its prospects are injured by recent and current trends in architectural style. For "combination men," who are both stonemasons and bricklayers, the outlook is fully as good as for bricklayers.

Nature of Work

The work of stonemasons may be divided into two principal parts: setting of cut stone, mainly on more expensive nonresidential buildings, and rubble stone work in which the mason trims the rough stone to size as he sets it. In some localities, there is an occasional job using field stones in which fitting to dimensions is done by choosing stones of different sizes, with a minimum of trimming.

Stonemasons deal strictly with natural stone and with artificial stone (concrete units made to size for an individual building just as is cut stone, and not including ordinary concrete block). In most localities, the greater part of their work is setting of cut stone exteriors for comparatively expensive buildings—office buildings, hotels, university buildings, churches, public buildings of various sorts, and an occasional residence. There is a small amount of stone veneer work, in which a thin covering of cut stone is applied to the exterior of a house or other building which is basically of frame construction, very much like brick veneer. There are also some buildings with stonework at the principal entrance or other special locations but with brick for the remainder of the exposed masonry. In some cases stonemasons set incidental stonework in brick walls, but usually scattered pieces are set by the bricklayers.

For cut stone work, a mason is guided by a large-scale setting diagram in which each piece

is shown to scale and is identified by an individual number (in some jobs plain rectangular pieces, known as "ashlar," are not numbered individually). A tender, known as a derrickman, locates the pieces to be needed and brings them to the mason. If sufficiently large and heavy, they are set in place by a derrick or crane, but most pieces are picked up and set by hand. The mason prepares a mortar bed, places the stone in the bed, and taps it into position as needed with a wooden mallet until it is in proper alignment. Because of the expense, a wall of solid cut stone is exceedingly rare; usually the stone is mainly a rather thin covering on the exposed surface or surfaces, with brick or other less expensive materials used for the remainder of the wall thickness. Sometimes the bricks are laid by the stonemasons, but, in cities large enough for the distinction between bricklaying and stonemasonry to be observed, they are put in place by bricklayers. Stonemasonry is much more exacting than brickwork in the details of appearance. Surfaces, edges, and mortar joints are much more easily seen and are viewed much more critically; hence, it is necessary that alignment be maintained much more accurately, that joints be uniform, and that minor chipping of the corners be avoided.

Rubble stone work was an important structural material until superseded by concrete but is now used only for appearance in some houses and other buildings and in some places for a few minor uses, such as low retaining walls at the edge of steeply banked lawns. It uses rough stone, which the mason cuts (breaks) to size as he lays it. He lays the pieces in a bed of mortar but does not maintain uniform horizontal courses or vertical joints such as are used for brickwork. Pieces can be cut and fitted rapidly in this manner by a skilled man, but it is still handwork and correspondingly expensive; hence, this type of work is uncommon.

Where Employed

Stonemasons' employment is principally in the construction industry. There is also employment in the larger cities in building of family mausoleums.

Training and Qualifications

Training is through apprenticeship which in some features is similar to that for bricklaying. There are also combination apprenticeships preparing for both brickwork and stonework, in localities where there is not enough stonework for reasonably steady employment.

Outlook

It seems very likely that stonemasonry will continue in use permanently, but there are strong indications that it will be used less extensively than in the past. The trend toward simpler lines means less stone ornamentation and less extensive use of moldings and other pieces than plain ashlar. The trend is also toward larger window areas in some kinds of buildings, with less exterior wall area. Gothic is no longer the unchallenged first choice in university architecture. Changed architectural preferences have also appeared in church buildings, and there are some indications that a similar change will come in public buildings within the fairly near future, although perhaps not immediately.

These considerations mean likelihood of a gradual decline in employment. This will probably be slow enough so that it will not threaten present members of the trade, especially since average age is high, and new workers will certainly be needed; but, since this is both a small trade and a contracting trade, the apprenticeship opportunities are limited.

Wage Rates

The table shows hourly wage rates effective July 1, 1948, as established by collective bargaining agreements in a number of cities. In each case, these apply to a surrounding area as well.

Area	*Hourly rate*
Atlanta, Ga.	$2.25
Baltimore, Md.	2.50
Birmingham, Ala.	2.25
Buffalo, N. Y.	2.50
Chicago, Ill.	2.40
Cincinnati, Ohio	2.50
Cleveland, Ohio	2.37½
Denver, Colo.	2.25
Houston, Tex.	2.50
Indianapolis, Ind.	2.40

Area	Hourly rate
Jackson, Miss.	2.25
Kansas City, Mo.	2.25
Little Rock, Ark.	2.50
Los Angeles, Calif.	2.62½
Louisville, Ky.	2.50
Milwaukee, Wis.	2.20
Minneapolis, Minn.	2.25
New Haven, Conn.	2.40
New Orleans, La.	2.05
New York, N. Y.	[1]3.20
Omaha, Nebr.	2.25
Philadelphia, Pa.	2.40
Pittsburgh, Pa.	2.70
Portland, Oreg.	2.50
Richmond, Va.	2.50
St. Louis, Mo.	2.75
San Francisco, Calif.	2.81¼
Seattle, Wash.	2.36½
Springfield, Mass.	2.32½

[1] 35-hour workweek.

Additional Information

Additional information, including the address of the nearest union local, may be obtained by writing to the Bricklayers, Masons and Plasterer's International Union of America, 815 Fifteenth Street, NW., Washington 5, D. C.

Cement Finishers

Nature of Work

The principal work of this trade is the finishing of the exposed surface of concrete work, with any pitch wanted for water drainage, etc. Other work includes patching the surface of structural concrete after the forms have been removed, laying of mastic floors, and laying of composition (magnesium cement) floors.

Finishing of concrete floors and other concrete members is the most important source of employment. This work is done on sidewalks, driveways, curbs, roofs, stairs, and many other structures or structural members, as well as floors. Pouring of concrete which is to have a trowel-finished surface sometimes proceeds in two stages—first the main mass of material containing gravel or other coarse aggregate, which is leveled off about one-half inch below the final surface, and then a top coating of finer material without gravel, which is spread onto the coarser concrete below. In such cases, it is mainly this fine mixture with which the cement finishers deal. In other cases there is no separate top coating, and the finishers deal with the surface of the main mass of concrete. In either case they spread the material to about the level desired by means of a straightedge, guided by strips which they have set to indicate the proper surface, and then trowel it a number of times at different stages of hardening. Often a level surface is wanted, and in other cases a slope is wanted for water drainage—toward the floor drains in a garage floor, toward one or more sides of a concrete roof slab, etc. Provision for this slope is made in final grading of the ground (for a slab resting on the earth) or in building of the forms, and in pouring of the rough concrete, but it is the finisher's job to produce a final top surface conforming to that desired. Finishing of curved rather than approximately flat surfaces (street curbs, curbs at the edge of driveways, etc.) is done in a generally similar manner. More similar to plastering (particularly stucco work) is the job of applying an outer covering of fine material to retaining walls and other vertical surfaces. This is done after the forms have been removed, a few days after the main mass of concrete has been poured.

The patching work occurs mainly in concrete-frame buildings and is done to correct surface defects which are exposed when the forms are removed. Fins protruding where joints in the forms were too wide are chipped off and ground with an abrasive; "honeycomb" areas, where there had been insufficient spading during placing of the concrete, are cleaned, with any loose material removed, and are filled with a cement-sand mixture; and similar minor corrections are made for the purpose of improving the appearance of concrete which is to be exposed in a completed building.

Mastic floors are a layer of fine asphalt mixture, quite like that used for the top surface of street paving, and are usually laid over concrete. They are used where resistance to acid is necessary — mainly in dairies, ice cream plants, breweries, and other factories in the food-products industry. The material is applied hot and is smoothed with heavy hand tools.

Composition floors are thin layers made with a type of magnesium cement laid over a rigid base. The operations involved are very similar

to those for finishing a concrete floor, but modified by differences in the characteristics of the material. At one time these were popular for small commercial buildings, but now they are used mainly for deck surfaces and similar uses in shipbuilding.

Finishing of newly poured concrete usually involves overtime work, frequently quite extensive overtime, because of the characteristics of the materials. On better-grade jobs, where high standards of workmanship prevail, the finishing operation continues to a final troweling when the fine material is fairly rigid, and this is several hours after it has been poured. The setting time depends on the temperature and the type of cement used but is fairly lengthy in any case. For re-enforced floors in buildings, very often pouring is continued until after the normal quitting time in order to reach boundaries where a break in the concrete will not introduce structural weakness; this means that the cement finishers often do not complete their work before 10 and may work until midnight or later. Such hours bring high daily and weekly earnings when they occur, but they are offset by intermittent employment, because it is exceedingly uncommon for pouring of building concrete to go on day after day; ordinarily one or a few days of pouring are followed by days of building forms, setting re-enforcing steel, and making other preparations for the next pour. Sidewalk and driveway work is more regular, because many of the contractors for such work are able to obtain a continuous series of moderately small jobs, but on this work the overtime is usually less. The jobs are smaller, there is seldom the engineering necessity for pouring until a suitable boundary is reached, and pouring often stops earlier in the day. The finishing specifications are also less exacting in many cases, so that troweling can be stopped at an earlier stage of setting. In small localities, many journeymen are both cement finishers and plasterers, and in such places there is apprenticeship for the two trades combined.

Where Employed

Cement finishers are employed predominantly in the construction industry. Some work for "cement contractors" doing mainly small jobs such as sidewalks, driveways, small retaining walls, basement and garage floors, etc.; these men work fairly regularly, except that the volume of employment is low in winter, and outdoor work is postponed for rain. Some work for city paving contractors, mainly on street curbing; this employment is rather similar to that for "cement contractors." Some work for general building contractors or for re-enforced concrete contractors on finishing of floor slabs and roof slabs in concrete-frame and steel-frame buildings. There are numerous other jobs—on bridges, abutments, and most structures where concrete is used. The early concrete highways were finished by hand, but finishing machines have been used for a number of years; hand-finishing of highways is confined mainly to curves and irregular areas outside the range for which the finishing machine rails are set up, although on most concrete paving crews there are cement finishers to perform smoothing operations supplementary to that of the finishing machine. Mastic floors are laid mainly by finishers specializing in such work, who move to successive jobs over a quite wide area; the same is true of composition floors.

Government units (municipal public works departments particularly), utilities, some manufacturing firms, and a certain number of miscellaneous establishments also hire cement finishers.

Outlook

The employment outlook at the present time is very good, and it should continue to be good for a number of years, because this is likely to be an expanding trade. Use of concrete in building construction has increased and seems likely to increase further. A comparatively few years ago re-enforced concrete construction was almost unknown for apartment buildings below luxury grade, but it has become moderately common in investment housing projects as well as in public housing. Houses without basements, with a concrete floor slab laid on the ground, have come into use, and have been stimulated by their suitability for panel ("radiant") heating. Other uses have also developed or grown, and further development is very likely.

The prospect is for gradual increase in the total volume of employment, but not for a change in its basic characteristics. Nothing evident to date indicates likelihood of substantially improved regularity of employment or an evening out of the alternation in concrete frame buildings between days with extreme overtime and days of lay-off.

While finishing machines are highly satisfactory for paving work, the vastly different conditions for other types of poured-in-place concrete make the use of similar machines unlikely. Small machines for finishing floors, etc., have been used for several years and have proved valuable on flat surfaces. These consist of an electrically rotated blade covering an area about 3 feet in diameter which is moved over the floor by the cement finisher.

Wage Rates

Below are the wage rates established by collective bargaining agreements and in effect on July 1, 1948, in a number of cities. In each case they apply to a surrounding area as well.

Area	*Hourly rate*
Atlanta, Ga.	$2.10
Baltimore, Md.	2.15
Birmingham, Ala.	2.07½
Boston, Mass.	2.50
Buffalo, N. Y.	2.23
Chicago, Ill.	2.35
Cincinnati, Ohio	2.10
Cleveland, Ohio	2.25
Denver, Colo.	2.25
Houston, Tex.	2.00
Indianapolis, Ind.	1.95
Jackson, Miss.	2.00
Kansas City, Mo.	2.05
Little Rock, Ark.	2.00
Los Angeles, Calif.	2.11¼
Louisville, Ky.	1.95
Milwaukee, Wis.	1.95
Minneapolis, Minn.	2.15
New Haven, Conn.	2.40
New Orleans, La.	1.75
New York, N. Y.	[1]2.75
Omaha, Nebr.	1.95
Philadelphia, Pa.	2.25
Pittsburgh, Pa.	2.50
Portland, Oreg.	2.00
Richmond, Va.	1.75
St. Louis, Mo.	2.37½
San Francisco, Calif.	2.15
Seattle, Wash.	2.06½
Springfield, Mass.	2.32½

[1] 35-hour workweek.

Additional Information

For additional information, or for the address of the union local nearest you, write to the Operative Plasterers' and Cement Finishers International Association, 200 Fidelity Building, Cleveland 14, Ohio; or the Bricklayers, Masons, and Plasterer's International Union of America, 815 Fifteenth Street, NW., Washington 5, D. C. Information may also be obtained from the Apprenticeship Committee of the Associated General Contractors, 1227 Munsey Building, Washington 4, D. C.

Structural and Ornamental Iron Workers

Outlook Summary

Opportunities are good for at least the next several years for those who want to enter as apprentices. The field for ornamental metal work has increased noticeably within the last two decades, and further increase seems very likely.

Nature of Work

Structural iron workers erect the steel framework for buildings. Best known are the tall buildings common in downtown locations, but structural-steel columns and roof framing are used frequently in one-story factory buildings and to some extent in other types of buildings. Factories may also require steelwork for crane runways and to support heavy equipment. The men in this trade also put up steel bridges and towers and install or erect certain types of tanks. They install steel floor decking, which has become popular for office buildings and other buildings having light floor loads. In some cases they set structural-steel members in place when they occur in buildings not of steel frame design, such as beams over wide doors and windows in masonry walls to support the brickwork above. Structural iron workers erect steel scaffolding and sidewalk canopies for use by other construction trades and for protection of the public, both for new buildings and repair work. The steel scaffolding for exterior repairs to a tall building can be a fairly large job in itself. Other work includes the placing of vault doors with their frames and installing the steel plate work covering the exterior of burglar-resistive vaults. Struc-

tural iron workers do rigging (moving of heavy machinery, equipment, etc.), except in those localities where rigging is treated as a separate occupation.

In erecting a steel framework or structure, the structural iron workers first take the steel shapes already fabricated by other workers and hoist them into place in the proper order. They then connect them temporarily with bolts, accurately align the structure as necessary, and rivet or weld the parts together.

Ornamental iron workers typically handle lighter materials, such as those not making up the basic framework of a building. The name "ornamental iron" is historical and is likely to be misleading. Within recent years a large part of the work, probably more than half, has dealt with other metals than iron and steel—mainly aluminum alloys, brass, and bronze. In some cases the installations are highly decorative, although along much simpler lines than 20 or 30 years ago, while other installations are strictly utilitarian.

Ornamental iron workers install metal stairways (which are much commoner than they seem, because the treads and platforms are commonly filled with concrete) and the railings and handrails at stairways, balconies, and elsewhere. They install metal floor-gratings, catwalks, and ladders, used extensively in powerhouses and a few types of factories. They put in place solid metal sash and doors and their frames, including the common steel sash used in many kinds of buildings; swinging and revolving metal doors with their frames; and vestibules at the street entrances to office buildings, hotels, etc. Other work done includes doors, grilles, and screens, such as used at bank tellers' compartments and elsewhere; gratings; metal cabinets of many types, such as display cases and safety deposit boxes; window and door guards; and a very wide variety of other installations.

Where Employed

Structural and ornamental iron workers are engaged largely on new construction. They are also employed on alteration work, such as insertion of a mezzanine floor in steel-frame buildings; installation of steel stairs, during modernization of an old apartment or commercial building, or the addition of window guards to an existing building for burglary protection. There is even a little repair work, despite the durability of the materials — replacement of members weakened by long neglect of painting, replacement of bridge parts damaged by bad traffic accidents, etc.

The structural workers do no fabrication of their materials beyond reaming out of mispunched rivet holes and other small corrections of shop errors. In general the ornamental workers likewise do no fabrication, although some of the smallest contractors (especially in small communities) do not distinguish sharply between shop crews and field crews. Occasionally, larger contractors use some of their erecting crews for shop work to handle peak loads, but this practice is not prevalent because of the substantially higher wage scale for the erecting men.

Ornamental iron workers are commonly employed within commuting distance of home because establishments capable of doing a wide variety of work can be maintained on a fairly low volume of business and hence are found in many localities. Ornamental metal for an occasional elaborate building in a small city is likely to be provided by a contractor from a larger city, who ordinarily either sends his own crew or sends a partial crew and hires other workers locally.

On the whole, more traveling is involved for structural iron workers, because most localities have insufficient structural business to support an erection contractor or local crew. Consequently, workers must be brought in from outside to handle the occasional structural work that occurs, such as a steel-frame office or factory building. Workers living in the largest metropolitan centers and preferring employment there are likely at times to find that the only vacancies are for out-of-town jobs.

Training and Qualifications

The standard apprenticeship period is 2 years, with provision for another 6 months of training if necessary. Men with several years of experience as helpers sometimes become journeymen, but, as the trade is highly unionized, few enter without serving a formal apprenticeship.

Outlook

Employment prospects for the next several years are very good, and, although not many additional workers will be needed thereafter, the outlook will continue to be good for those already at work in the trade.

Prospects for structural workers are improved by developments in the use of steelwork intended for buildings with light floor loads. There has also been increased recognition of advantages of steel construction in some kinds of one-story nonresidential buildings. The possibilities of a fairly new type of unconventional design ("rigid frames") are likely to be realized much more fully than in the past.

For ornamental metal work, prospects are likewise good. It is admirably suited to recent trends in architectural design; there has been steady progress in its fabrication; and it is likely to be used more extensively in buildings where cost is an important consideration, because for many uses there is now a fairly wide range of stock and semistock parts (such as extruded mouldings). Strictly utilitarian uses are likely at least to be sustained, if not increased.

For many years ornamental metalwork has been used to some degree as an exterior covering on buildings. Within recent years this has consisted mainly of panels for covering the spandrels,[8] but the Equitable Savings and Loan Building (mentioned in the section on bricklayers) established a precedent in having an exterior of ornamental metal rather than masonry above the second-floor level. This is likely to be the forerunner of more extensive use of exterior metalwork, but the effect will be gradual rather than sudden. So great a departure from conventional practice as that embodied in the Equitable case requires revision of building ordinances and is in a field of strong conflicting interests.

Some workers will also be needed to replace those who leave these trades because of death, retirement, or shifting to other kinds of jobs.

Wage Rates and Working Conditions

Minimum wage rates established by collective bargaining agreements for structural iron workers and in effect on July 1, 1948, in a number of areas are given in the table below. In most areas rates for ornamental workers are the same or differ by only a few cents.

Area	*Hourly rate*
Atlanta, Ga.	$2.00
Baltimore, Md.	2.40
Birmingham, Ala.	2.07½
Buffalo, N. Y.	2.40
Chicago, Ill.	2.40
Cincinnati, Ohio	2.35
Cleveland, Ohio	2.37½
Denver, Colo.	2.00
Houston, Tex.	2.12½
Indianapolis, Ind.	2.32½
Jackson, Miss.	2.00
Kansas City, Mo.	2.20
Little Rock, Ark.	2.00
Los Angeles, Calif.	2.10
Louisville, Ky.	2.10
Milwaukee, Wis.	2.05
Minneapolis, Minn.	2.17½
New Haven, Conn.	2.50
New Orleans, La.	2.00
New York, N. Y.	3.00
Omaha, Nebr.	2.05
Philadelphia, Pa.	2.65
Pittsburgh, Pa.	2.50
Portland, Oreg.	2.12½
Richmond, Va.	2.25
St. Louis, Mo.	2.42½
San Francisco, Calif.	2.40
Seattle, Wash.	2.26½
Springfield, Mass.	2.30

Workers in the erection crews receive much higher wages than do shop workers. However, structural and ornamental workers in construction are not as steadily employed throughout the year as shop workers. Since there is little maintenance and repair work that they can do during the dull building season, annual earnings usually are low relative to the hourly wage rates.

Accidents are infrequent but in structural work are likely to be quite serious. Safety standards have been greatly improved over those prevalent 25 years ago, and safety measures, such as nets and scaffoldings, are used much more extensively. Nevertheless, it cannot be expected that accidents will be completely prevented. Men occasionally fall from high places, and that is likely to be fatal unless they are stopped by a safety net; men are also occasionally hit by falling objects, and once in a long

[8] A spandrel is that part of the exterior wall directly above the head of a window, extending upward to the sill of the corresponding window on the next story.

while in past years there has been a catastrophe such as collapse of the structure.

Additional Information

For further information about apprenticeship for either of these trades, write to the International Association of Bridge, Structural, and Ornamental Iron Workers, Syndicate Trust Building, St. Louis 1, Mo., or regarding structural metal work, write to the National Erectors' Association, 33 West 42d Street, New York 18, N. Y.

Rodmen (Reenforcing Iron Workers)

Outlook Summary

The employment outlook for rodmen is good and should continue to be good for a number of years because of a prospective increase in the importance of re-enforced concrete work.

Nature of Work

Rodmen set the re-enforcing steel for re-enforced concrete work of all sorts. Most of this is in the form of steel bars, which, by the time of concrete pouring, must be assembled in proper relation to each other and supported in the forms so that each piece is in the position where it gets the intended structural load. Re-enforcing for round columns usually comes assembled from the plant, but collapsed, and is merely spread out to the proper shape, tied, and then placed inside the column forms. Other bar re-enforcing comes as separate bars, cut to length and bent as necessary at the plant, but not assembled. The rodmen are guided by a drawing on which all re-enforcement is indicated, and the code numbers used for the different pieces are given. They select the pieces, put them together into framelike assemblies for beam or rectangular column re-enforcement, tie all intersections securely with wire, and place these assemblies in the forms on wire supports ("chairs") as necessary. When occasion arises, they weld the pieces together. They assemble the re-enforcing rods for slabs and concrete joists in a somewhat similar manner, but by building up the assembly in the forms. As necessary, they cut and bend the bars, when the shopwork of cutting and bending has been done incompletely or incorrectly. Some re-enforcing is in the form of a coarse mesh made of heavy steel wires. The rodmen cut the mesh to the desired size and set it in place with overlapping edges where pieces join.

There are of course many structural uses for "plain" concrete — i.e., concrete without re-enforcing steel. These applications provide no employment for rodmen.

This is one of the less highly skilled trades, acquired through a 2-year apprenticeship. It requires dexterity, familiarity with established usage in re-enforced concrete construction, and a full realization of the necessity for assembling the bars accurately, and fastening and supporting them securely so that each will in fact bear the structural load for which is was designed.

Where Employed

Rodmen are employed almost entirely in the contract construction industry. The employers include general contractors for re-enforced concrete buildings, general contractors for other structures (bridges, dams, some types of sewer and water projects, etc.), special trade contractors for re-enforced concrete work, and (in large cities) special trade contractors for the setting of re-enforcing steel. There is no doubt some force-account employment on new construction, and probably a little employment (for utilities, municipal public works departments, etc.) in force-account maintenance, but very few maintenance and repair jobs involve rodmen's employment.

Outlook

Because of the increasing use of re-enforced concrete, the outlook for this trade is good. Seasonal variation in employment is important, however, because almost all re-enforced concrete work is done outdoors and is hindered by cold weather. Employment in many cases is intermittent, because setting of re-enforcing is only one of many activities fitted together in the over-all construction process; in a multistory concrete building, the rodmen are finished when a given floor is ready for pouring and often do not start again until pouring is completed, column and beam forms for the next floor are completed, and floor forms are almost

completed. Of course, the more active contractors for re-enforcing have several jobs under way at once and are able to transfer their workers from one to another, but risk of lost time is usually greater in work where many of the jobs last only to a few days, than where jobs last several weeks or a few months.

Wage Rates

Below are minimum wage rates in effect July 1, 1948, in a number of cities and their surrounding areas, as established by collective bargaining agreements.

Area	*Hourly rate*
Atlanta, Ga.	$1.75
Baltimore, Md.	2.10
Birmingham, Ala.	1.82½
Boston, Mass.	2.40
Buffalo, N. Y.	2.40
Chicago, Ill.	2.40
Cincinnati, Ohio	2.20
Cleveland, Ohio	2.37½
Denver, Colo.	2.00
Houston, Tex.	2.00
Indianapolis, Ind.	2.32½
Jackson, Miss.	1.75
Kansas City, Mo.	2.07½
Little Rock, Ark.	1.75
Los Angeles, Calif.	1.97½
Louisville, Ky.	1.90
Milwaukee, Wis.	1.91¼
Minneapolis, Minn.	2.05
New Haven, Conn.	2.50
New Orleans, La.	1.70
New York, N. Y.	[1]2.75
Omaha, Nebr.	2.05
Philadelphia, Pa.	2.25
Pittsburgh, Pa.	2.50
Portland, Oreg.	1.92½
Richmond, Va.	2.00
St. Louis, Mo.	2.42½
San Francisco, Calif.	2.15
Seattle, Wash.	2.06½
Springfield, Mass.	2.30

[1] 35-hour workweek.

Additional Information

For additional information, or for the address of the nearest union local, write to the International Association of Bridge, Structural, and Ornamental Iron Workers, Syndicate Trust Building, St. Louis 1, Mo.

Boilermakers

Outlook Summary

The short-range outlook for boilermakers is fair only, because of continued reduction in railroad employment, as the replacement of steam locomotives by Diesel locomotives continues. The outlook in other employment fields, including construction, is good. Additional journeymen must be trained for this trade before many years, but there must be an adjustment of the number of journeymen to the reduced employment field. Because of the fairly high average age of present journeymen, this adjustment will probably be achieved within a comparatively few years by deaths and retirements, without the necessity for present journeymen to transfer to other occupations.

Nature of Work

Boilermakers constitute mainly a shop rather than a construction occupation and are engaged in the building of ships, barges, etc., and in the manufacture of steam boilers (power, marine, and locomotive, and also low-pressure heating boilers), pressure vessels for industrial uses, some kinds of tanks, and numerous other products. They are employed extensively in maintenance and repair of ships, locomotive and marine boilers, powerhouse boilers, and some kinds of industrial equipment. Construction employment consists mainly of the assembly in place of power boilers too large to be shipped completely assembled, the building of some kinds of tanks, and the building in place of many types of industrial equipment (other than pipe work) operating under pressure or vacuum, particularly for oil refining and other chemical operations, but in other industries as well. Factory manufacture of boilers, tanks, stills, etc. is not regarded as construction employment, although the products are to be used in construction.

Outlook

The outlook for boilermakers' employment in construction is good, but for the present this is overshadowed by the quite poor outlook in building and repair of steam locomotives, and by reduced employment in shipbuilding. This trade is basically in active, healthy condition and should be marked by some degree of ex-

pansion after the necessary adjustments have been made to employment reduction in the railroad and shipbuilding field. Until such adjustments are well advanced, however, its employment prospects are inferior to those of many other trades.

Wage Rates

Minimum wages rates established by collective bargaining agreements and in effect on July 1, 1948, in a number of areas are given below.

Area	*Hourly rate*
Atlanta, Ga.	$2.00
Baltimore, Md.	2.25
Boston, Mass.	2.25
Buffalo, N. Y.	2.40
Chicago, Ill.	2.40
Cincinnati, Ohio	2.15
Cleveland, Ohio	2.30
Denver, Colo.	2.15
Houston, Tex.	2.12½
Indianapolis, Ind.	2.35
Kansas City, Mo.	2.15
Los Angeles, Calif.	2.15
Louisville, Ky.	2.25
Milwaukee, Wis.	2.20
Minneapolis, Minn.	2.15
New Orleans, La.	2.00
New York, N. Y.	2.75
Philadelphia, Pa.	2.25
Pittsburgh, Pa.	2.25
Portland, Oreg.	2.15
Richmond, Va.	2.25
St. Louis, Mo.	2.25
San Francisco, Calif.	2.15
Seattle, Wash.	2.15

Additional Information

For additional information, write to the International Brotherhood of Boilermakers, Iron Shipbuilders, and Helpers, Brotherhood Building, Kansas 11, Kans.

Operating Engineers (Construction Machinery Operators)

Outlook Summary

The outlook is for additional job openings for several years, with a trend toward further but probably slow expansion.

Nature of Work

The types of work vary in their requirements of training and skill probably more for operating engineers than for any other trade. These men operate construction machinery of almost all sorts for practically every type of construction: buildings, highways and streets, airfields, sewer and water lines, underground utility work, tunnels and subways, railroad work, bridges, dams, dredging, harbor improvement, and numerous other types. This machinery is used for many purposes, including excavating, grading, and earth-moving; mixing of concrete and other materials; hoisting; loading, unloading, and handling materials; pile driving; rolling of earth and pavement; pumping; and providing of power in the form of compressed air and in other forms. There are many different types of machines. Some are quite complex, requiring coordination of numerous motions and controls; others are simpler but require constant active attention; and still others are simple in operation and require infrequent attention. These differences in a sense break the trade into several levels of skill.

Among the machines operated are shovels; pull-shovels; draglines; cranes; derricks; hoists; pile drivers; stationary concrete mixers; paving mixers; bituminous paving mixers and paving machines; numerous types of rollers; trench excavators; elevating graders; "pans" (tractor-drawn scrapers); bulldozers; graders (self-propelled and tractor-drawn); tractors; pumps; and air compressors. In addition, there are many others. For the most part, operators learn their work quite informally and in the course of experience become familiar with a number of kinds of machines; a capable operator can ordinarily learn to handle other machines of the same general types as those on which he is experienced, within a fairly short time. Differences in requirements for operation of the various types of machines are recognized by differences in wage rates, mentioned later. Operators are often known by titles, based on the machines which they are using, as shovelman, craneman, hoistman, etc., but these titles do not indicate separate occupations. The more experienced and capable operators, able to handle a wide range of machines, frequently

prefer one or two types, and work on these when such jobs are available but at other times work on quite different machines. Naturally, the differences in wage rates cause all men who are qualified to confine themselves to the top grade of machines (shovels, cranes, trench excavators, paving mixers, a number of others) as much as possible, and men who are employed on machines carrying lower wage rates want to transfer to the more difficult machines as opportunity affords.

Where Employed

Operating engineers are employed in the construction industry by general building contractors, by special trade contractors (for excavating, steel erection, and other special trade fields), by highway contractors, and by heavy construction contractors for the remaining kinds of nonbuilding work. They also work for utility companies, government bodies (highway departments, public works departments, etc.), and other organizations carrying out their own construction. In addition they work in many industries not engaged in construction. In some cases the machines and the duties are about the same in these other industries as in construction; operation of a crane to unload cars of coal at a factory or a power plant is very similar to operation of a crane to unload cars of sand or gravel for a paving job. In other cases the machines are the same but the duties rather different; manipulation of the controls for handling heavy assemblies by crane at a factory is the same as for handling heavy objects by crane at a construction job, but the conditions governing the work are different. Still other kinds of jobs have no close equivalents between construction and factory employment, although the coordination of numerous controls make them the same general kind of job.

Wage rates in factory employment are usually much less than in construction, but greater regularity of employment is likely to make annual earnings greater in a number of cases.

Training and Qualifications

In some localities there is a formal apprenticeship for operating engineers, but this arrangement is not general. For machines operated by steam power, it is necessary under most circumstances for the operator to have a stationary engineer's license. When all machines of any size were driven by steam, possession of a license tended to distinguish journeymen from others. At this stage there was usually a fireman on the larger machines, and many of these men were able to qualify for licenses and to advance to operating engineers. Replacement of steam power started more than 30 years ago, and has been virtually complete for all but a very few types of machines for almost 20 years, so that this means of entrance to the trade has been almost completely closed. Oilers are employed on the larger machines under some circumstances, and some of these men advance to operating machines under some circumstances, and some of these men advance to operating engineers just as firemen did under earlier circumstances. For the most part, however, entrance has been quite informal; a man with aptitude for machinery and often some relevant experience, such as driving a truck, may get a job operating one of the simpler machines (a pump, an air compressor, a tractor without attachments, etc.) and obtain union membership. As opportunity affords, he may get more exacting jobs (on a bulldozer, a tractor with other power attachments, a roller, various other machines) and then with more experience get a job on one of the top-grade machines.

The jobs vary greatly in their requirements. Some are quite easy, while others require continuous attention throughout the day, with careful timing and accurate coordination of numerous controls. There has been great improvement in grouping the controls for convenience and in reducing the physical work of moving them, but operation of the more complicated machines is strenuous work. Some machines (particularly bulldozers and some types of scrapers) are physically wearing, because of the shaking and jolting which the operator receives all day long.

Pile drivers are the principal machines for which steam is now used, and for which the operator must have a stationary engineer's license in most localities.

Outlook

The long-range outlook is for an increased

use of construction machinery. The construction machinery industry started with units which, although basically fairly simple, were large, heavy, expensive, and suited only for big projects. There has been devolopment in different directions. One course has been the design and production of larger, more specialized, and more complex machines, some having constantly increasing output (such as several of those used for earth-moving), and some performing a group of related operations (such as some machines used in asphalt-paving). Another course has led to smaller and more readily portable machines suited to progressively smaller jobs. Machines for new uses have also been brought out from time to time. These developments have been notably rapid within recent years and show every sign of continuance; small as well as large companies have been active in increasing the usefulness of their products. Because all construction projects are temporary, the degree of mechanization is necessarily less than in many kinds of factory operation, but the limit of mechanization has by no means been reached as yet. In fact, because of continued machine development, no inflexible limit can be foreseen for mechanization of any kind of building work.

Wage Rates

The wage-rate picture for operating engineers is quite the most complicated for any construction trade. Hourly rates are established for different types of machines, very commonly with different rates for machines of the same type but of different capacity and, in some cases, with different rates for a given machine depending on the type of construction for which it is used. Classification systems vary greatly among different areas, and machines having the top wage rates in one area do not necessarily have the top wage rate in all other areas.

Space does not permit a detailed presentation of wage rates because of the different classification systems used in different localities. Below are minimum wage rates in effect July 1, 1948, in a number of areas as established by collective bargaining for shovel operators (who have the highest rate in most but not all areas) and for bulldozer operators (who have a lower rate in most cities).

Area	Hourly Rate	
	Shovels	*Bulldozers*
Atlanta, Ga.	$1.80	[1]$1.40
Baltimore, Md.	2.20	1.57½
Birmingham, Ala.	2.00	1.77½
Boston, Mass.	2.45	2.07½
Buffalo, N. Y.	2.40	——
Chicago, Ill.	2.35	2.05
Cincinnati, Ohio	2.25	2.00
Cleveland, Ohio	2.37½	2.12½
Denver, Colo.	2.15	2.00
Houston, Tex.	——	[2]1.87½
Indianapolis, Ind.	2.20	2.20
Jackson, Miss.	1.87½	1.75
Kansas City, Mo.	2.27½	2.05
Little Rock, Ark.	2.00	1.75
Los Angeles, Calif.	2.23¾	2.03¾
Louisville, Ky.	2.15	2.15
Milwaukee, Wis.	2.35	[3]2.00
Minneapolis, Minn.	——	2.00
New Haven, Conn.	2.10	1.70
New Orleans, La.	1.87½	1.62½
New York, N. Y.	3.12½	——
Omaha, Nebr.	2.15	1.87½
Philadelphia, Pa.	2.50	1.87½
Pittsburgh, Pa.	2.65	2.55
Portland, Oreg.	[4]2.00	——
Richmond, Va.	1.87½	1.75
St. Louis, Mo.	2.55	——
San Francisco, Calif.	[5]2.52½	——
Seattle, Wash.	[6]2.50	2.15
Springfield, Mass.	2.15	1.70

[1] 40 hp. or over, $1.50.
[2] When cutting to finish grade, $2.12½.
[3] Over 40 hp., $2.20.
[4] 1 to 5 cu. yds., $2.10, over 5 cu. yds., $2.35.
[5] Over 1 cu. yd., $2.62½.
[6] 120-B type capacity, $2.80.

Additional Information

For additional information write to the International Union of Operating Engineers, 1003 K Street, NW, Washington 1, D. C.

Lathers

Outlook Summary

The outlook for lathers is very good at the present time and should continue to be good. This is, however, one of the smaller trades and so can provide comparatively few apprenticeship openings.

Nature of Work

A lather's principal work is installing a base to which plaster or stucco is to be applied. In houses, nonfireproof apartment buildings, and many other buildings, this base usually consists

of gypsum lath or insulating lath (pieces of perforated gypsum board or perforated insulating board) which is nailed to wood members. For more exacting work, he uses metal lath (large pieces of sheet steel which have been slit and "expanded" to give an over-all mesh pattern) or occasionally a coarse-mesh wire screen similar to hardware cloth. When used in ordinary construction to give greater strength at critical locations only (in bathrooms and elsewhere to give a strong plaster backing for wall tile, at interior corners of walls and ceilings to prevent cracking, etc.) this is also nailed to supporting wood members. For the most part, however, in a metal lath job the lather first builds a light supporting framework of light steel channels (commonly known as light iron furring), fastened securely to the structure proper, and ties the metal lath to the framework with wire. This is done for suspended ceilings, which are hung down from the structural floor above to allow space for pipes, ventilating ducts, etc.; it is commonly done at columns, to provide space for pipes, etc., behind the plaster; it is done to provide a base for plaster enclosure of beams, ventilating ducts and other members, protruding downward from the ceiling. In some cases, when a ceiling is to be plastered in concrete joist construction, metal lath is fastened to the bottom of the joists to bridge over the open spaces between them; in other cases, a level bottom surface is obtained by use of structural tile or other material as fillers between the joists. The usual type of solid plaster partition consists of a core of metal lath and metal channels, fastened securely to the floor and the ceiling, and plastered on both sides; a newer and less common type uses sheets of gypsum board as a core, and these are also installed by lathers. If there is to be a plaster cornice, the lather builds out beneath it with channels and metal lath to a rough approximation of the profile that is wanted, in order to reduce the thickness and weight of plaster that is needed. Lathers also install corner bead and many other supplementary items. For stucco over wood construction, they nail a large-mesh wire fabric (much coarser than metal lath) onto the wood. Wood lath, the original material, has declined greatly in importance and in many localities is scarcely used when gypsum lath or insulating lath is available.

Not all plastering means a job for lathers, however. In fire-resistive construction, partitions (when not of solid plaster) are structural tile or gypsum block, to which plaster is applied directly. Exterior walls often have what is essentially a tile lining, also plastered directly. In contrast, there can be lathing without plastering—principally the building of frameworks of metal supporting channels, quite similar to those for suspended plaster ceilings, for installation of acoustical tile.

The two outstanding requirements to be met by lathers' work are accuracy and sturdiness. True vertical, horizontal, and curved surfaces must be provided within rather close limits; the lath backing for cornices must be level and accurate in profile. Unless these requirements are met, the plasterers cannot do a presentable job without using an excessive thickness of plaster, and hence an excessive weight, for some parts of their work. Channels must be fastened securely enough to the structure proper so that they withstand the pressure during plastering, and beyond any question will support permanently the weight of the plaster despite possible vibration of the building, the impact of any heavy objects that may be dropped onto the floor above, and other contingencies.

Where Employed

Lathers work principally in the construction industry, mainly on new construction but on modernization and alterations to a considerable degree. There is also extensive employment elsewhere, in the lath-backing for display material, scenery, etc., when this is made of plaster.

Outlook

The outlook for lathers is good, for a number of reasons. Commercial modernization will continue to be important, and it often emphasizes types of work (new ceilings, flat, or in many cases curved) for which lathing is needed. Acoustical treatment moved out of the luxury class several years ago and is being increasingly accepted as a standard feature in many types of commercial buildings. Suspended ceilings are probably more common than in the past. A new fireproofing method for structural steel (described briefly in the section on plasterers) consists of enclosing the steel members in a

framework of light channels covered with metal lath, to which a particular type of lightweight plaster is applied. This method is likely to become popular. At the same time, however, the work has been much more seasonal than that of most other trades, and in that respect has been very similar to plastering.

Wage Rates

Minimum wage rates in a number of cities and their surrounding areas, established by collective bargaining agreements and in effect on July 1, 1948, are given below.

Area	Hourly rate
Atlanta, Ga.	$2.00
Baltimore, Md.	2.25
Birmingham, Ala.	2.00
Boston, Mass.	2.50
Buffalo, N. Y.	2.40
Chicago, Ill.	2.40
Cincinnati, Ohio	2.25
Cleveland, Ohio	2.37½
Denver, Colo.	2.25
Houston, Tex.	2.50
Indianapolis, Ind.	2.15
Jackson, Miss.	1.75
Kansas City, Mo.	2.20
Los Angeles, Calif.	[1]2.25
Louisville, Ky.	2.10
Milwaukee, Wis.	2.25
Minneapolis, Minn.	2.35
New Orleans, La.	2.00
New York, N. Y.	[2]2.75
Omaha, Nebr.	2.15
Philadelphia, Pa.	2.50
Pittsburgh, Pa.	[3]2.62½
Portland, Oreg.	2.25
Richmond, Va.	1.87½
St. Louis, Mo.	2.25
San Francisco, Calif.	2.50
Seattle, Wash.	2.26½
Springfield, Mass.	2.10

[1] 30-hour workweek.
[2] 35-hour workweek.
[3] Residential—$2.25.

Additional Information

For additional information, or for the address of the union local nearest to you, write to the International Union of Wood, Wire and Metal Lathers, 2605 Detroit Avenue, Cleveland 13, Ohio.

Plasterers

Outlook Summary

Job opportunities for plasterers during the next few years are excellent and additional workers must be trained. Plastering will always be an important part of building construction, as far as can be seen at the present time, although there will probably be changes in the relative importance of the different kinds of work.

Nature of Work

The principal work of plasterers is the application and finishing of several coats of plaster to a suitable base, to produce wall and ceiling surfaces and stucco exterior wall surfaces. In some interior work, they produce textured surfaces which get no further decorative treatment, and, in more elaborate work, they produce surfaces in imitation of stone, marble, or other materials. In some types of buildings they produce curved ceilings and in ornamental work obtain a great variety of architectural effects using cornices, pilasters, vaulted and groined ceilings, arches, and relief ornamentation.

This occupational statement includes the work of plasterers only, exclusive of modelers, model makers, casters, and sculptors (engaged mainly in the shop production of relief plaster pieces for building and other uses). While the work is closely related, these are distinct occupations.

Where Employed

Employment is primarily in the construction industry and almost exclusively at the construction site. Most of this is in new construction, but plastering is usually needed in extensive alterations and has become particularly important as a means of obtaining architectural and lighting effects in commercial modernization. Repairs in old buildings are restricted in both number and size by the durability of plaster.

Training and Qualifications

A 4-year apprenticeship, or its equivalent, is needed for qualification as a journeyman. During this period the apprentice is trained in a wide variety of skills, of which manipulation of

the tools is only one part. He must learn the properties and appropriate handling of the different kinds of materials and the different mixtures; the characteristics of various backing materials or bases to which the plaster is applied; and procedures for getting true vertical and horizontal surfaces. He must also acquire ability to lay out curved, arched, vaulted, and other ornamental work which (when elaborate) presents difficult geometrical problems; he must learn methods of forming cornices and moldings in place, of installing shop-made ornamental pieces and fastening them securely, and of applying and forming wet plaster onto ornamental pieces to join them smoothly or to add small repetitive figures which cannot be put on conveniently at the shop. The apprentice should become familiar with the work of other trades and must learn to judge from inspection whether lathing and other preparatory work is satisfactory.

Standard apprenticeship includes 144 hours of classroom instruction each year, with particular attention to drawing, blueprint reading, and mathematics applicable to lay-out work.

Outlook

The expected volume of construction will require many more plasterers than the number employed just before the war. During recent decades the number of apprentices trained was comparatively small, but more than 7,000 have been registered by the Operative Plasterers' and Cement Finishers' International Association since the beginning of 1946.

The long-range outlook is affected by several conditions, some favorable and others not. Many attemps have been made to get less expensive surfacing materials for ordinary walls and ceilings, and some of the materials made in sheet form have been used widely. It is likely, however, that alleviation of the shortage of plasterers will cut down the use of these other materials to at least some degree.

Public taste and architectural usage have changed, so that ornamental plastering in large metropolitan buildings (banks, the lobbies and public rooms of major hotels, the lobbies of leading office buildings, etc.), is used much less extensively than prior to the depression. It was in such buildings, in churches, in movie theaters, and in larger government buildings, that ornamental plastering had its real market. There is little doubt that such work will always be used to some degree in certain types of buildings, and it seems likely to be used extensively in a few types, particularly some churches. For nonresidential buildings as a whole, however, the trend toward simpler lines seems to be the desire of owners and architects.

While the demand for plastering has been reduced in these directions, it has been increased in others. Within the past 20 years acoustical treatment has had widespread adoption, and plastering is one of the means by which such treatment is obtained.

During the same period, extensive attention has been given to lighting, including the effect of ceiling design. This has been most pronounced for retail stores, restaurants, and similar establishments, but by no means confined to such places. The result here has been a marked trend toward curved ceilings, commonly with recesses for concealed lighting fixtures or with flush fixtures fitting into rather than protruding from the ceiling. This work obviously required many more man-hours than would an ordinary flat ceiling for a room of the same size. Curved surfaces as a form of architectural or decorative treatment, without special consideration for lighting effects, have also come into increasing use.

Very recently a new method of fireproofing structural steel members came into use, consisting of enclosing them in metal lath to which a lightweight gypsum plaster is applied. Tests to date indicate that this method provides satisfactory fire protection, and it has the advantage of a great saving in weight over poured concrete, which has been standard for the purpose. Widespread use of this method is likely, with resulting employment for plasterers, although in some places adoption may be delayed until building ordinances are revised.

Stucco finish on exterior walls has been used widely in certain parts of the country and used to at least some degree almost everywhere. Greater use may be expected because of an increased range of finishes and colors that can be provided, suitable to almost any architectural style.

Wage Rates

Minimum wage rates in effect on July 1, 1948,

as established by collective bargaining agreements for a number of cities and their surrounding areas, are given below.

Area	Hourly rate
Atlanta, Ga.	$2.25
Baltimore, Md.	2.25
Birmingham, Ala.	2.20
Boston, Mass.	2.50
Buffalo, N. Y.	2.40
Chicago, Ill.	2.40
Cincinnati, Ohio	2.37½
Cleveland, Ohio	2.37½
Denver, Colo.	2.25
Houston, Tex.	2.50
Indianapolis, Ind.	2.35
Jackson, Miss.	2.00
Kansas City, Mo.	2.50
Little Rock, Ark.	2.50
Los Angeles, Calif.	[1]2.25
Louisville, Ky.	2.25
Milwaukee, Wis.	2.25
Minneapolis, Minn.	2.35
New Haven, Conn.	2.40
New Orleans, La.	2.00
New York, N. Y.	[1]3.00
Omaha, Nebr.	2.25
Philadelphia, Pa.	2.50
Pittsburgh, Pa.	2.62½
Portland, Oreg.	2.35
Richmond, Va.	2.25
St. Louis, Mo.	2.50
San Francisco, Calif.	[1]2.25
Seattle, Wash.	2.36½
Springfield, Mass.	2.32½

[1] 30-hour workweek.

While hourly wage rates have been high, annual earnings prior to the war were comparatively low. In part this was caused by a workday in some cases shorter than was common for other trades (in some localities a 6-hour day in comparison with an 8-hour day for most of the trades) and in part by seasonal unemployment.

Plastering in a small building is a comparatively brief job, and such jobs tend to be seasonal because of concentrated rental and sales seasons for new apartments and houses. Work on nonresidential buildings is less seasonal and, when these are sufficiently large, the plastering extends over several months. Almost three-fourths of the plasterers working in 1939 had at least 6 months of work, but only a third had work for 9 months or more during the year.

Additional Information

If you want the address of a union local which sponsors apprentice training in your locality, write the Operative Plasterers' and Cement Finishers International Association, 200 Fidelity Building, Cleveland 14, Ohio, or to the Bricklayers, Masons, and Plasterer's International Union of America, 815 Fifteenth Street, NW, Washington 5, D. C. Information on apprenticeship may also be obtained from the Contracting Plasterers International Association, 1327 Majestic Building, Detroit 26, Michigan.

Marble Setters, Tile Setters, and Terrazzo Workers

Outlook Summary

The outlook for marble setters is good; for tile setters, uncertain but probably fairly good; and for terrazzo workers, is decidedly good. Each of these trades is comparatively small, and each is essentially an urban trade.

Nature of Work

These trades are distinct, although occasionally combined in small places. The purposes served are broadly similar, but there are fairly sharp differences in the skills required and the detailed character of the work performed.

Marble setters install marble, and other materials handled in a similar manner, almost entirely in the interior of buildings. These materials are used principally in nonresidential buildings (office buildings, banks, public buildings, etc.) but also extensively in hotels, to some degree in elevator-type apartment buildings, and to a small degree elsewhere. The principal uses are for wall surfaces in entrances, lobbies, banking rooms, and other public spaces, for wall surfaces and stall partitions in toilets, for the front and top surfaces of tellers' counters, for the treads and risers of stairways and in some cases for the railings as well, and for customers' check desks in banks. There are numerous infrequent uses, such as window and door trim. Marble setters install natural marble, shop-made artificial marble (making of artificial marble in place is the work of the plaster-

ers), shop-made terrazzo in panels or other pieces, some kinds of stone cut into thin pieces and used like marble, and structural glass[9] in the interior of a building. (Structural glass used outdoors, as above a store window, is set by glaziers.)

The marble setters use materials made to exact size and polished before delivery and do no fabrication beyond what may be needed for minor fitting and for attachment of hardware. They lay out the work carefully to insure accurate fitting, apply a special plaster mixture to the backing material (a tile or metal lath-plaster partition, a brick core for a bank counter, etc.) to hold the marble pieces in the proper position and alignment and to attach them securely, set the pieces in place, and when necessary brace them until the setting plaster has hardened. For toilet partitions, some of the pieces are usually mortised into others, and the setters fit these together and apply the hardware for supporting and connecting them. Usually each setter has a helper. The helpers prepare plaster, do much of the carrying of the marble (large panels weigh as much as several hundred pounds each), act as general assistants but do not use tools, and clean the surface of the completed work.

Tile setters deal with floor and wall tile, which are thin ceramic materials (not self-supporting) used as a final surface over other materials. Wall tile comes as separate pieces, handled individually—plain square or rectangular pieces for the bulk of the work, and specially shaped pieces for the corners, for the base where the wall joins the floor, for the cap at the top edge, and for numerous other uses. Large pieces of floor tile are also handled individually, while small pieces come in sheets of several dozen glued to a paper backing, and as far as possible are handled in sheets.

In nonresidential buildings, floor tile is installed in the entrances, lobbies, corridors, and toilets, and less frequently in many other places —stair landings, restaurant kitchens, laboratories, operating rooms, and numerous others. In houses, it is frequently used for bathroom floors, but seldom elsewhere, and, in apartment buildings, it is used mainly for bathrooms, entrances, and corridors. Wall tile in residential buildings is used mainly for the wainscot[10] in bathrooms, and occasionally elsewhere. In nonresidential buildings it has many applications, of which the more important is probably in toilets, but it is used extensively in hospitals, in kitchens of well-equipped restaurants, hotels, and institutions, and to a smaller extent in many other places. For almost all of their uses, wall tile and, to a greater extent, floor tile are in active competition with other materials.

A tile setter lays out the room in which he is working so that the surfaces will be where intended and all high spots in the rough wall or floor will be covered without any bulges. He applies a backing of stiff mortar and puts the tile in place so that the pieces and joints will make the desired pattern. As necessary, he cuts pieces of tile to fit the dimensions or to fit around pipes, etc. For a floor he covers the area with a stiff mortar layer and then lays the tile in sheets as far as possible, using partial sheets or individual pieces to fill out the dimensions or to give a border or other pattern different from that of the sheet-mounted pieces. Standard practice is that he works with a helper, who mixes the mortar, keeps him supplied with materials, sets up portable scaffolding if needed for high work, fills the joints after the setting is finished, and finally cleans the completed work.

Terrazzo is essentially a type of ornamental, non-structural concrete, in which marble chips are used as the coarsest ingredient; it is ground and polished after hardening to give a smooth surface in which the marble chips are exposed against a background of other material. Very commonly a colored background is obtained by mixing pigment with the sand and cement, with white sand and white portland cement used as necessary for the lighter colors. Choice of the type or types of marble chips used obviously governs their color. Shop-made terrazzo is used to varying degrees for wainscoting, toilet stall partitions, stair treads, etc., but such pieces are installed in the same manner as pieces of marble. A terrazzo floor is usually divided into a number of distinct areas by means of thin metal strips to localize and minimize any cracks resulting from settlement of the building. All

[9] Structural glass is a type of thick, sturdy plate glass, nontransparent, polished on one side or both sides, made in a fairly extensive range of colors.

[10] The wainscot is the lining of an interior wall, especially of the lower part when this is different from the upper part.

areas may have the same color pattern, but usually there is color contrast at least between the main body of the floor and the border, and in many cases further color contrast is used. Areas of different color are separated by metal strips to obtain sharp distinction. Simple geometrical patterns, such as squares of alternating color, are the most common, but lettering, symbols, trade-marks, etc., not involving fine detail, have become fairly popular for retail stores and elsewhere.

A terrazzo worker starts by laying a first course of fine, fairly dry concrete, leveling this accurately and tamping it. He then places the metal strips wherever there is to be a joint between panels or a change in color, embedding their bottom edges in this first course. If there is to be lettering or an ornamental figure, he embeds a shop-made mold for this also. Then he mixes the top course, pours it onto the lower course, and levels it; there is, of course, a separate batch for each color, made with the appropriate kinds of marble chips and pigment, and each is placed inside the strips bounding the areas of that particular color. After a few days of hardening, the floor is ground by abrasive blocks rotated by power, protruding down from a heavy machine which is moved slowly back and forth over the floor. This grinding is continued until there is a smooth, level surface slightly below the original top edge of the strips. Installation of a terrazzo base is generally similar but differs in detail. In these operations, the terrazzo worker is assisted by helpers for mixing and placing the base course but does the leveling himself, places the metal strips, and at least supervises mixing of the top course, which (along with the grinding) governs the final appearance. The grinding is usually done by another worker.

Outlook

The outlook for marble setters is probably about the same as that for building journeymen as a whole. Marble is used less than formerly to give an appearance of luxury to otherwise mediocre buildings, and it is much less popular than some years ago for a few applications, particularly soda fountains. It is also used much less than formerly in the toilets of nonresidential buildings. Its excellent qualities need no description, however, and it is suitable in buildings of almost any architectural style. In buildings where initial cost is not the first consideration, it seems likely to maintain its present position. Use of structural glass and some other alternate materials does not affect the work of marble setters, although it does reduce the employment of marble shop workers; where these are used as alternates for tile, they actually increase the employment of marble setters.

Although tile is a splendid material, greatly improved over a period of years by its manufacturers, the outlook for tile setters is uncertain because of the active competition of other materials. For floors, it has been replaced to a considerable degree by terrazzo. While the architectural possibilities of tile have been more fully appreciated and more fully developed within the last quarter century, the same is even more true of terrazzo. Improvements in asphalt tile (laid by soft-floor layers or carpenters) have made it a strong competitor of ceramic floor tile, in buildings where first cost is important. For wall surfaces, structural glass has established a definite place for itself, and increasing use of plastic and plastic-coated wallboard seems likely. Partitions of glazed finishing tile (described briefly in the section on bricklayers) have been used in some applications in place of rough partitions covered with plaster and wall tile. Two fairly large manufacturers have brought out porcelain enameled metal sheets for wall surfaces in house bathrooms, both apparently satisfactory. Each is for use with a specific factory-made assembly of additional house parts, but other firms are known to be contemplating the manufacture of similar products for a more general market. There is no question that tile will continue to be an important material and no question that it has a combination of desirable qualities not fully obtainable otherwise. There is serious questions, however, that it will continue permanently to be used as extensively as in the past, in view of the active development of competing materials.

Terrazzo work is likely to expand, with very good long-range prospects, as recognition of its possibilities continues to increase. From its nature, of course, it will continue to be one of the small trades despite expansion.

For tile work and also for terrazzo work and especially for the two in combination, there is probably an opportunity in many of the smaller cities (mainly of 10,000 up to 25,000 population) for a capable journeyman to establish himself as a small contractor, working on the jobs himself. These trades have been practiced mainly in larger places, and use of these materials has been hindered in the smaller cities by absence of a local man able to do a competent job and to advise local owners, builders, and contractors on just what can be done with tile and terrazzo. This opportunity does not extend to marble setting, because marble contracting requires a more extensive shop than can be supported by the local volume of work in most small cities.

Wage Rates

Minimum wage rates in effect July 1, 1948, as established by collective bargaining agreements for a number of cities and the surrounding areas of each are given below.

Area	*Hourly rate*		
	Marble setters	*Tile setters*	*Terrazzo workers*
Atlanta, Ga.	$2.25	$2.25	$2.25
Baltimore, Md.	2.25	2.25	2.25
Birmingham, Ala.	2.25	2.00	2.00
Boston, Mass.	2.25	2.25	2.25
Buffalo, N. Y.	2.35	2.37½	2.37½
Chicago, Ill.	2.35	2.35	2.35
Cincinnati, Ohio	2.50	2.34	2.34
Cleveland, Ohio	2.25	2.25	2.25
Denver, Colo.	2.25	2.25	2.25
Houston, Tex.	2.25	2.25	2.25
Indianapolis, Ind.	2.00	2.00	2.00
Jackson, Miss.	2.25	2.25	2.25
Kansas City, Mo.	2.22½	2.22½	2.22½
Little Rock, Ark.	2.50	2.50	2.50
Los Angeles, Calif.	2.25	2.50	2.40
Louisville, Ky.	2.00	2.00	2.00
Milwaukee, Wis.	2.10	2.15	2.20
Minneapolis, Minn.	2.25	1.90	2.15
New Haven, Conn.	2.40	2.40	2.40
New Orleans, La.	2.05	2.00	2.00
New York, N. Y.	2.75	2.75	2.75
Omaha, Nebr.	2.10	2.10	2.10
Philadelphia, Pa.	2.45	2.40	2.45
Pittsburgh, Pa.	2.25	2.12½	2.50
Portland, Oreg.	2.00	2.12½	2.00
Richmond, Va.	2.50	2.25	2.25
St. Louis, Mo.	2.25	2.17½	2.30
San Francisco, Calif.	2.25	2.37½	2.25
Seattle, Wash.	2.26½	2.11½	2.11½
Springfield, Mass.	2.32½	2.32½	2.32½

Additional Information

For additional information about any of these trades, or the address of the nearest union local, write to the Bricklayers, Masons, and Plasterer's International Union of America, 815 Fifteenth Street, NW, Washington 5, D. C.

Painters and Paperhangers

Outlook Summary

Opportunities for new workers are limited in each of these trades, and the outlook is not encouraging. There has seldom been an excess of fully competent men, and there is not an excess at the present time, but property owners' standards of workmanship have been low in many cases, and both trades have been overcrowded with partially trained workers much of the time. Technological developments in paints and finishes, developments in other building materials, and the increased extent to which property owners do their own redecorating combine to lower the employment outlook. Fully competent men will of course be needed, but they will be subject to disadvantages absent in many of the other trades. The brightest part of the outlook is the notable improvement in standards for commercial decorating and even greater improvement in standards for industrial painting.

Nature of Work

Painting and paperhanging are recognized as separate trades, but many men (including the great majority of those doing redecorating) perform both types of work.

Painters are skilled workmen who prepare surfaces and then apply paint, varnish, enamel, lacquer, and similar materials, to buildings and other structures. Some work is on the exterior, for protection from the weather as well as for appearance; indoor work is primarily for appearance in most cases but may be for protection also. Repainting and redecorating houses, apartments, and commercial buildings make up a large part of the work; in such work, painting and paperhanging are usually done by the same men. An important maintenance field is repainting for protection of factories, warehouses, etc., and of outdoor structures, such as tanks and

bridges. In small places, the painters also do glazing, and "combination men" skilled in both trades are recognized.

The most important part of many painting jobs is preparing the surface, especially in repainting of old work. On high-grade jobs, rough spots must be sandpapered, nail holes and other imperfections filled, dust brushed off and grease washed off, and any loose paint removed by scraping or, if it is in sufficiently bad condition, by heating with a blowtorch and then scraping. Areas scraped down to the wood must be primed to give a suitable surface for the new paint. Then the new paint is applied with a brush or, in some cases, a spray gun.

A painter must be able to mix paint of all standard types from the basic ingredients, to match color samples by mixing colored pigments with either the basic ingredients or with prepared paint, and, of course, to set up safe scaffolding appropriate to whatever working conditions he encounters. He must know the characteristics of all common types of paints and finishes from the standpoint of durability and suitability for different purposes and also from the standpoint of handling and application. He should have a good knowledge of color harmony, because owners and tenants will frequently want his suggestions on choice of colors. He must be skillful in handling brushes and other tools in inconvenient positions, such as directly overhead, and be able to apply the materials uniformly, thoroughly, and rapidly, to any type of surface.

Paperhanging involves trimming off the edges of a sheet of wallpaper; pasting it; folding it for temporary storage until several sheets are ready; placing it on the wall or ceiling; cutting it as necessary to fit window trim, etc.; adjusting it until its pattern matches that of the next strip; smoothing it so that it adheres firmly all over; and rolling the joint. In redecorating work it may be necessary to remove the old paper by soaking or, if there are many layers, by steaming; it is also necessary in many cases to do minor plaster patching in order to get a smooth surface for the paper. Paperhangers also handle other materials calling for generally similar operations — cloth-backed wood veneer, imitation veneer, and some others.

Where Employed

About 80 percent of the painters as described in this statement work in the construction industry, as employees or as self-employed workmen. The remaining 20 percent are employed as maintenance painters in almost all industries. Hotels, office buildings, railroad and other utility companies, manufacturing firms, school boards, other government units, and organizations of every sort that own extensive property commonly employ maintenance painters. When the interior redecorating involves papering also, as in hotels or apartment buildings, usually the maintenance painters must be able to do paperhanging as well. Some of these maintenance jobs also involve nonconstruction work, such as refinishing of furniture at a hotel or painting window display material at a department store. There is some degree of nonconstruction painting requiring full journeyman skill, as in painting of large pieces of machinery during manufacture, but most painting of factory products (whether by brushing, dipping, or spraying) is handled as semiskilled work.

For paperhangers, the percentage of employment in the construction industry is even greater than that of painters. There are many maintenance jobs, but in most cases these require competence in painting also; maintenance employment for paperhanging only is much less frequent than for painting only and is likely to be found only at an unusually large hotel, an unusually large apartment group, or some other uncommon type of establishment.

Training and Qualifications

A 3-year apprenticeship is provided for either of these trades, although less formal training has been fairly common. A number of the union locals have offered special courses by which journeymen competent in one trade could be trained in the other. In some cases, they have accepted into membership applicants without formal training after an oral examination and a demonstration of their ability. Policies in this respect are decided by the locals. While acceptance as a journeyman has been easier for those without formal training than in many of the other trades, it should kept in mind that a high level of competence (which means thorough training) is particularly important for those

wishing to be accepted and paid as craftsmen in a field having a large number of mediocre workmen.

Outlook

There is a great deal of painting to be done in new construction and in repainting and redecorating existing structures. Nevertheless, the employment outlook is comparatively poor, for several related reasons. Painting is a trade in which labor cost usually exceeds material cost. For some of the most important operations, in fact, material cost is negligible—washing of walls preparatory to repainting, scraping or burning off loose or scaly old paint, other preparatory jobs. Any saving in labor cost makes a greater proportionate saving in total cost than in trades where material expense is high; thus pressure for saving in labor cost is greater than for most other trades. For the commonest grade of papering, in which cheap wallpaper is used, labor cost is also a high part of the total; this is not the case, however, on the better grades of decorating for which expensive papers are used.

In the painting and paperhanging fields, the number of self-employed workmen and small contractors is unusually large, so that ordinarily there is keen competition for work, particularly redecorating work. Since owners' standards of workmanship are frequently low, and for rental property the desire in many cases is merely to give a fresh surface until it is time for another redecorating job, much of the work is done by poorly trained men at correspondingly low wages. While the workmanship on such jobs is inferior to that of thoroughly trained journeymen, this kind of work is done in enough cases to cut down the volume of work available for the latter.

There seems also to have been a great increase within recent years in the extent to which property owners and occupants do their own interior decorating. New types of paint intended mainly for such use have been marketed actively and sold in very great quantity. Other new types of interior paint with improved "covering power" (opacity) have made it easier for inexperienced persons to do work meeting their own standards of acceptability; even though these latter products were not brought out primarily for the householder market, they are sold in great quantity through consumer outlets, such as drug stores and hardware stores. It is probably a safe assumption that workmanship has been poor and final results disappointing in many cases of strictly amateur redecorating of this sort, but there are no indications of a decrease in such work.

The same conditions of competition from informally trained workers hold, although probably to a smaller extent, for exterior repainting. Competition from property owners doing their own painting is much less. The amount of exterior repainting done has been cut by two factors, however: improvement in paint materials and formulas, so that painting is needed less frequently; and covering of wood exteriors with other materials (asbestos shingles, imitation brick with or without insulating backing, etc.) which do not need painting, although the time-consuming "trim" work at door and window openings is not reduced thereby.

Long-range trends in building design and an unmistakable trend to the use of more completely processed material are also unfavorable to the painters to some degree. Many items formerly painted at the building site now come from a factory ready for installation, with at least a priming coat and often with a final, permanent finish. Even prefinished hardwood flooring has been brought out and has met with a ready acceptance. Aluminum products, requiring no painting either at the factory or at the job, have been introduced within fairly recent years and made in increasing quantity—garage doors, roof gutters and downspouts, window sash and frames. While these are still luxury items, they are less so than in the past, and expansion into a still wider market seems likely. The trend in design has been toward simpler lines and simpler ornamentation, readily noted by comparison of window and door casings popular now with those popular some years ago. This change, simplifying the work of painters and of other trades as well, seems still to be in progress.

From an employment standpoint, spray painting is unfavorable but probably less so than is commonly supposed. The painters' union has accepted spray work, provided methods and equipment protecting the health of the workers are used. Conditions differ greatly from those in painting of factory products, however, and

the full timesaving possible in factory work can seldom be realized in construction painting. Commonly, it is necessary to cover nearby areas with masking type or to use other measures to keep the paint off places where it is not wanted. Wind can be a serious hindrance outdoors. A spray outfit is obviously not applicable to preparing the surface before the paint is applied, and, unless this work is done carefully and thoroughly (especially in repainting of old surfaces), the results will be unsatisfactory, regardless of how the paint is applied.

The situation is not greatly different for paperhangers, despite the fact that in some areas there are only a few thoroughly competent men. Like painting, this field has had the problem of a large number of semitrained men who, however, do work good enough to satisfy many property owners. Paperhanging by property owners has always been done to some degree. It may have increased within recent years through use of "ready pasted" (i.e., adhesive-backed) paper, but it has never been common and it seems unlikely to affect employment prospects substantially. Much more serious has been the painting of walls by property owners with the new types of interior oil paints and especially with water-emulsion paints. The common practice of applying these latter over loose wallpaper is a sufficient indication of the low standards of redecorating workmanship held by many property owners and their consequent unwillingness to pay the prices necessary for careful, competent work.

While the outlook for residential work has been deteriorating, that for nonresidential work has been improving. The importance of an attractive interior for retail establishments is recognized as never before. For factories of many types, the standards for interior painting have risen greatly—to obtain better lighting, to improve morale, to increase safety, in some cases to designate trucking lanes and storage spaces, etc. While such improvement is already widespread, the trend toward higher standards still seems to be in effect.

All of these considerations mean that painting and paperhanging cannot be regarded as expanding trades, but they are not by any means in process of disappearing. Under these conditions there is not only room for additional well-trained men but need for them. Such men will, however, find competition much keener than in expanding trades or in trades where inferior work done by property owners and poorly-trained workmen is less acceptable. Real aptitude for the work and through training are more important for a person expecting to be recognized in his locality as a craftsman and to obtain corresponding earnings.

Wage Rates

Minimum wage rates for painters and paperhangers in a number of cities and their surrounding areas, as established by collective bargaining agreements and in effect on July 1, 1948, are given in the table below. In many places established rates are higher for some types of painting—by use of a spray gun, from a swinging scaffold, and painting of structural steel. These rates should be considered with recognition of the high seasonal unemployment to which painting and decorating work has been subject.

Wage rates for maintenance painters are ordinarily substantially lower than the established scales paid in new construction. Annual earnings may actually be higher in many cases, however, because of more regular employment. In some cases it is necessary for organizations having their own maintenance painters to concentrate their work within a brief period (school redecorating during the summer vacation period, for example), but many establishments are able to carry on repainting and redecorating work throughout the year. When they can do so conveniently, they usually prefer to employ one or a few painters continuously, rather than a larger gang intermittently.

	Hourly rate	
Area	*Painters*	*Paperhangers*
Atlanta, Ga.	$1.75	$2.00
Baltimore, Md.	1.77½	1.77½
Birmingham, Ala.	2.00	2.00
Boston, Mass.	2.00	——
Buffalo, N. Y.	2.12½	2.12½
Chicago, Ill.	2.15	2.15
Cincinnati, Ohio	2.00	2.00
Cleveland, Ohio	2.12½	2.12½
Denver, Colo.	1.92½	1.92½
Houston, Tex.	1.87½	1.87½
Indianapolis, Ind.	2.00	2.00
Jackson, Miss.	1.75	1.75
Kansas City, Mo.	2.05	2.05
Little Rock, Ark.	1.62½	1.75

Area	Hourly rate: Painters	Hourly rate: Paperhangers
Los Angeles, Calif.	2.00	——
Louisville, Ky.	1.82	[1]1.50
Milwaukee, Wis.	1.80	——
Minneapolis, Minn.	1.95	1.95
New Haven, Conn.	2.00	2.00
New Orleans, La.	1.62½	1.62½
New York, N. Y.	[2]2.30	[2]2.30
Omaha, Nebr.	1.75	1.62½
Philadelphia, Pa.	2.05	2.05
Pittsburgh, Pa.	2.20	2.20
Portland, Oreg.	1.87½	2.02½
Richmond, Va.	1.62½	1.62½
St. Louis, Mo.	2.07	2.07
San Francisco, Calif.	[2]2.15	[2]2.15
Seattle, Wash.	2.06½	2.06½
Springfield, Mass.	1.87½	1.87½

[1] 44-hour workweek.
[2] 35-hour workweek.

Additional Information

For additional information, write to the Brotherhood of Painters, Decorators and Paperhangers of America, Painters and Decorators Building, Lafayette, Indiana, or to the Painting and Decorating Contractors Association of America, 12 South Twelfth Street, Philadelphia 7, Pa.

Glaziers

Outlook Summary

There will be job openings in the next several years for a small increase in the trade, but openings thereafter will be little greater than those needed for replacement. This is one of the smaller trades.

Nature of Work

Glaziers install all types of glass, although not in all places where glass is used. In many localities the largest single part of their work has been the installation and replacement of plate glass in store windows. They also install ordinary window glass (sheet glass) in the windows and doors of houses, apartments, and business or factory buildings, put wire-glass in skylights and fire-resistant doors and windows, set mirrors when these are not already mounted, and install any unusual items, such as preassembled stained glass or leaded-glass panels.

Since it became available about 25 years ago, glaziers have installed structural glass (a nontransparent plate glass, usually polished on one surface only, made in a number of colors) as an ornamental surfacing on the exterior of buildings (usually for stores, above and below their display windows). Structural glass used in the interior of buildings is handled by marble setters. Glaziers install glass blocks under some conditions, but these are used mainly in exterior walls, where they are set in mortar by bricklayers.

Ordinary glazing work consists of cutting the glass to size (except where stock sizes fit without cutting, which is commonly the case with steel sash), speading a bed of putty around the edges of the opening, pressing the glass into place, fastening it with wire clips pressed into small holes in steel sash or with triangular metal points driven into the edge of wood sash, and then placing and beveling a strip of putty on the outside to keep out moisture. Plate glass, cut to size at the shop or at the job, is held in a special supplementary frame built into the store front and partially disassembled for the removal and replacement of glass.

In many localities the wood sash and doors used in ordinary residential building are glazed at the millwork factory. Factory glazing is much less practical for steel sash, because of greater difficulty in protection during transportation, handling, and installation. Even when both are glazed at the site, steel sash brings more work for glaziers than wood sash, because of the customary division into a number of small openings. While each of these can be glazed rapidly, in total they require more time than would a two-pane wood window having the same total glass area. In the past, shop glazing has been done mainly by semiskilled factory workers rather than by glaziers, and in most localities such sash have not been used on buildings constructed under collective bargaining agreements. During 1948 the international union removed its objection to installation of shop-glazed sash, provided the glass was installed by its members. This action is likely to mean greatly increased use of shop-glazed sash in numerous localities.

Glazing is primarily an urban trade. In large and moderately large cities it is done by men who are strictly glaziers, while in small cities it is frequently done by "combination men" who also do painting and, in many cases, paperhanging too. In places too small to support an establishment with a stock of plate glass, ordi-

nary glazing is done as a sideline by painters and often by carpenters or other journeymen, while occasional plate glass or structural glass jobs are handled by a crew from a larger city nearby.

Where Employed

The great majority of glaziers work in the construction industry as employees of glazing contractors. These men work on new construction, on alterations and modernization, and on replacement of broken glass, particularly in store windows. A few are employed in the manufacture of glass and in various industries as maintenance workers. Some have also been employed in millwork factories for shop glazing of sash, doors, etc., but, in the past, most of the men employed for such work were operatives rather than journeymen. Some have also been employed in factories for shop glazing of cabinets, store fixtures, etc., but much of this work has also been done by operatives.

Training and Qualifications

Glazing is a skilled craft customarily requiring 3 years of apprentice training. In most areas the trade can be entered only by way of formal apprenticeship, but in some localities helpers with several years of experience may qualify and be admitted to the trade as journeymen.

Outlook

The importance of glass in building construction, and hence the importance of glazing, show definite signs of increase. There is a trend toward the use of more glass in residential buildings, for which double glass assemblies[11] are one of several stimulating influences. Any increase in the extent to which shop-glazed sash are used will bring some reduction in the total work of setting glass, but there may be a small increase in the total employment of glaziers through their replacement of factory operatives.

In recent years there has been a very marked development of the use of glass in commercial buildings, especially retail stores. Store modernization has often been centered around improved store windows, which involves a completely new glass installation. It is also likely that structural glass will be used more widely than before. Architectural publications indicate a rather strong interest in larger glass areas for office buildings and other major downtown buildings. There has been some tendency to design retail buildings almost or completely without windows above the first story, and this was increased for a time following the wartime blackouts, but it seems to be temporary and already to be decreasing. Replacement of store windows broken by windstorms or other accidents is, of course, a year-round employment source for glaziers.

There is a present need for additional skilled workmen, because only a few apprentices have been trained within recent years to make up for those who died or retired. In the longer run, a few additional workers may be added to this relatively small occupation, but most of the job openings will be to replace workers who drop out of the trade.

Earnings

The minimum wage rates established by collective bargaining agreements as of July 1, 1948, are given in the table below for a number of cities and their surrounding areas.

Area	*Hourly rate*
Atlanta, Ga.	$1.75
Baltimore, Md.	1.92½
Birmingham, Ala.	1.80
Boston, Mass.	2.00
Buffalo, N. Y.	1.90
Chicago, Ill.	2.45
Cincinnati, Ohio	2.05
Cleveland, Ohio	2.25
Denver, Colo.	1.89
Houston, Tex.	1.87½
Indianapolis, Ind.	2.00
Jackson, Miss.	1.25
Kansas City, Mo.	2.15
Little Rock, Ark.	1.62½
Los Angeles, Calif.	1.96
Milwaukee, Wis.	2.00
Minneapolis, Minn.	1.85
New Orleans, La.	1.62½
New York, N. Y.	[1]2.75
Omaha, Nebr.	[2]1.70
Philadelphia, Pa.	2.09
Pittsburgh, Pa.	2.00
Portland, Oreg.	1.96

[11] These are assemblies of two panes of glass held in a light metal frame, separated by a layer of dry air, and handled in the same manner as a single pane of glass except that they must be ordered in the exact size wanted and cannot be cut satisfactorily after manufacture. Their purpose is to reduce heat loss.

Area	Hourly rate
St. Louis, Mo.	2.25
San Francisco, Calif.	2.00
Seattle, Wash.	1.96
Springfield, Mass.	2.00

[1] 35-hour workweek.
[2] $1.40 for shop work.

Additional Information

For additional information, or for the address of the nearest union local, write to the Brotherhood of Painters, Decorators, and Paperhangers of America, Painters and Decorators Building, Lafayette, Indiana.

Roofers

Outlook Summary

The outlook for roofers is substantially the same as that for construction workers as a whole. Their employment is better sustained than that of many other trades during periods of declining construction activity, however, because of the importance of maintenance, repair, and re-covering of the roofs of existing buildings particularly large nonresidential and apartment buildings.

Nature of Work

Roofers' work includes the application of composition roofing, such as built-up roofing; the installation of roofing tile, roofing slate, and a number of other roofing materials; and the waterproofing and dampproofing of wall surfaces, etc., for buildings and other structures. The first of these is the most important as a source of employment.

For built-up roofs, the roofers cover the surface with strips of asphalt impregnated felt, coating each strip thoroughly with tar, pitch, or other bituminous material. They lap each strip over the preceding strip sufficiently so that all parts are covered with the desired number of thicknesses, and coat each over its entire width before the next strip is laid down. Then they cover the entire exposed surface with bituminous material, and usually with gravel or slag to hold it down and protect it from the elements. Formerly hot tar or hot pitch was used almost exclusively and was applied by mopping. Emulsified asphalts applied without heating are now used also, and the most recent product of this general type can be applied by spraying. Built-up roofs are used mainly on nonresidential buildings and apartment buildings. Within recent years new types of material have been developed, permitting use of built-up roofs on steeper slopes than was formerly practical.

There are many types of waterproofing. It is used largely but not entirely below ground level and primarily on nonresidential buildings and some types of nonbuilding structures. While commonly used on large apartment buildings and hotels, it is seldom applied for houses, except where the ground water conditions are unusually bad. Among the locations where it is used are basement and areaway walls, to a smaller degree walls above ground level, floors below ground level, swimming pools and other tanks, and nonbuilding structures (such as cable vaults) below ground level. Waterproofing of walls is often done by coating them with hot bituminous material, covering this with felt or cloth, and then coating them again. Waterproofing of floors (between a lower and an upper layer of concrete) or of a sidewalk above a basement (between the concrete of the basement roof and the concrete of the sidewalk itself) is more similar to roofing. Some types of waterproofing are applied by spraying.

Dampproofing is a coating applied to interior and exterior surfaces, to prevent penetration of moisture. Ordinarily it is applied by spraying. Use of this treatment has been increasing, and seems likely to increase further.

Slate and tile come as separate pieces and are nailed into place individually; they are suitable only for surfaces having at least a fairly steep pitch. Tile roofs are popular for houses in some parts of the country but elsewhere are used mainly on nonresidential buildings having steep roofs—churches, some public buildings, some school and college buildings, etc. They are also used for ornamentation on various types of small retail buildings (gas stations, lunchstands, miscellaneous others), but the total amount of work involved for these is comparatively small. At one time slate roofs were used extensively on good houses but because of the great improvement in other materials such use has been infrequent for a number of years in most parts of the country and seems unlikely to increase. Slate is used on the same types of

nonresidential buildings as tile. In larger areas the men doing slate and tile roofing are different from those doing composition roofing. In general, slate and tile have been losing ground to other materials.

Where Employed

Roofers work almost exclusively in the construction industry on new construction and on maintenance and repairs. For built-up roofing there is a lot of maintenance and repair work; while high-quality roofs often last longer than the guarantee period, a great many owners choose lighter, cheaper roofs which usually need repairs after a very few years, and re-covering after a few more years. Waterproofing is usually not subject to maintenance and repair work; it lasts longer. Slate and tile never wear out, but individual pieces (particularly slate) are subject to breakage—by windstorms, by tree limbs, by baseballs and other objects, by being walked upon, and by concentrated stresses resulting from uneven settlement or from sagging of the supporting woodwork. On a nonresidential building or an unusually expensive house, the broken pieces are replaced at intervals, but on a good house below luxury grade, if the breakage is extensive, the owner is likely to replace the entire area with some less expensive material such as asphalt shingles.

Outlook

There is nothing to indicate a noteworthy change in roofers' employment. The importance of repair work on composition roofs helps to even out seasonal unemployment. There is lost time at all parts of the year because of rain or snow; the principal work that can be done during wet weather is trying to locate leaks that have been baffling at other times.

Wage Rates

Below are wage rates in effect for composition roofers and for slate and tile roofers on July 1, 1948, in a number of cities and the surrounding area for each, as established by collective bargaining agreements.

Area	Hourly rate: Composition roofers	Hourly rate: Slate and tile roofers
Atlanta, Ga.	$1.50	$1.50
Baltimore, Md.	1.65	1.90
Birmingham, Ala.	1.55	1.71
Boston, Mass.	2.15	2.15
Buffalo, N. Y.	2.15	2.30
Chicago, Ill.	2.40	2.40
Cincinnati, Ohio	2.00	2.12½
Cleveland, Ohio	2.30	2.37½
Denver, Colo.	2.10	2.10
Houston, Tex.	1.87½	2.12½
Indianapolis, Ind.	1.68	1.80
Jackson, Miss.	1.50	1.50
Kansas City, Mo.	1.90	1.90
Los Angeles, Calif.	2.00	2.00
Louisville, Ky.	1.55	1.85
Milwaukee, Wis.	1.90	2.05
Minneapolis, Minn.	1.90	1.90
New Haven, Conn.	2.25	2.50
New Orleans, La.	1.62½	1.62½
New York, N. Y.	2.75	2.75
Omaha, Nebr.	1.62½	1.82½
Philadelphia, Pa.	2.15	2.55
Pittsburgh, Pa.	2.25	2.25
Portland, Oreg.	2.00	2.00
Richmond, Va.	1.80	——
St. Louis, Mo.	2.12½	2.00
San Francisco, Calif.	2.16	2.16
Seattle, Wash.	[1]2.06½	2.15
Springfield, Mass.	2.00	2.20

[1] Composition, steep—$2.15½.

Additional Information

For additional information, or for the address of the nearest union local, write to the United Slate, Tile, and Composition Roofers, Damp and Waterproof Workers' Association, 130 North Wells Street, Chicago 6, Ill., or to the National Roofing Contractors' Association, 315 West Madison Street, Chicago 6, Ill.

Asbestos Workers

Outlook Summary

The immediate outlook for asbestos workers is very good, and the long-range outlook is above average for the construction trades. Good prospects for refrigeration installation and for industrial pipework (in oil refining, the chemical industry, some other industries) mean employment opportunities for asbestos workers.

Nature of Work

Employment is mainly for two principal types of work, plus one minor type. The first

of these, around which the trade was originally formed and from which its name is taken, is insulation against heat loss of boilers, pipes, kettles, tanks, and a wide variety of industrial equipment intended to contain steam or other hot substances. Insulation is applied to save fuel, to maintain the desired operating pressures or temperatures with greater uniformity, to keep down the temperature in the rooms where the equipment is located, and for several less frequent reasons. Straight runs of pipe are usually covered with short sections of prepared material, which are placed around the pipe and fastened. Boilers, tanks, kettles, etc., may be covered with prepared material in sheet form, or with a paste of asbestos mixed with other materials, followed by an outer wrapping of cloth. This last procedure is used for irregular surfaces, which are encountered to some degree in industrial insulating jobs and in most other jobs also. Insulation is installed in powerhouses (public utility, and at factories), in the boilerooms of large buildings of many types, on the main steam lines and sometimes on the branch lines of large heating installations (hotels, department stores, office buildings, large apartment projects, etc.) and, of course, in manufacturing establishments having industrial processes using steam, hot liquids, or hot gases.

The other principal type of work is insulation against absorption of heat. Some of this is done on the pipework, etc., of refrigeration installations (for cold storage, for freezing or other processing of foods and other commodities, for drinking water lines, under some circumstances in air-conditioning installations); this work is very similar to insulation of hot pipes or vessels against loss of heat. Related to this, although quite different in the materials used and the method of installation, is the insulation of enclosed cold-storage spaces too large for economical use of factory-made panels such as those from which ordinary "walk-in" cooling rooms are assembled. This cold-storage lining is applied to the walls, ceiling, and floor of a large space—in some cases an entire building. Often there are insulating partitions on the interior also, to permit maintenance of different temperatures in different portions.

In many localities a subdivision of this trade installs home insulation. This work is less skilled than the activities described above and carries a lower wage scale.

Where Employed

Employment is mainly in the construction industry, but there is a substantial amount of employment in numerous other industries for alterations and maintenance. Some types of chemical plants and others having extensive steam installations for power and heating are engaged in more or less continuous alteration and maintenance of their insulated pipework and apparatus, and employ asbestos workers for this work. Force-account maintenance employment for cold-storage installations is much more limited, and is uncommon unless at the very largest establishments in the major cities. There is also a substantial volume of employment at shipyards on new work, maintenance, and repairs.

Outlook

While asbestos workers will necessarily constitute one of the smallest trades, the employment outlook is good. Their work is closely tied to the increasing importance of pipework and related equipment in industrial plants, and to the increasing importance of refrigeration installations. This includes cold-storage locker buildings and other establishments, smaller than were formerly common, but too large for portable equipment and factory-made assemblies.

Wage Rates

Wage rates in effect on July 1, 1948, in accordance with collective bargaining agreements are given in the table below for a number of cities and their surrounding areas.

Area	*Hourly rate*
Atlanta, Ga.	$1.87½
Baltimore, Md.	2.12½
Birmingham, Ala.	1.90
Boston, Mass.	2.15
Buffalo, N. Y.	2.40
Chicago, Ill.	2.35
Cincinnati, Ohio	2.20
Cleveland, Ohio	2.25
Denver, Colo.	2.15
Houston, Tex.	2.00
Indianapolis, Ind.	2.20

Area	Hourly rate
Kansas City, Mo.	2.00
Little Rock, Ark.	2.00
Los Angeles, Calif.	[1]2.25
Louisville, Ky.	2.00
Milwaukee, Wis.	2.20
Minneapolis, Minn.	2.25
New Haven, Conn.	2.25
New Orleans, La.	[2]2.00
New York, N. Y.	[3]2.75
Omaha, Nebr.	2.15
Philadelphia, Pa.	[4]2.50
Pittsburgh, Pa.	2.25
Portland, Oreg.	2.20
Richmond, Va.	1.87½
St. Louis, Mo.	2.25
San Francisco, Calif.	1.90
Seattle, Wash.	2.16½
Springfield, Mass.	2.20

[1] Home insulators, $1.75.
[2] Home insulators, $1.62½.
[3] 35-hour workweek.
[4] Home insulators, $1.45.

Additional Information

For additional information, write to the International Association of Heat and Frost Insulators and Asbestos Workers, Ninth Street and Mount Vernon Place, NW., Washington, D. C.

Plumbers and Pipe Fitters

Outlook Summary

The outlook for plumbers and pipe fitters is excellent at present and, on a long-range basis, is very good. There has been a long-continued trend to greater emphasis on plumbing and other pipework, and this is likely to continue.

Nature of Work

Journeymen in the plumbing and pipe-fitting industry install, alter, and repair the piping systems (including fixtures and similar parts) for household and other water use, and for heating, steam power, refrigeration, fire sprinklers, industrial processing, and numerous other purposes. This broad field has been divided among several trades, but a few years ago the international union representing all of them adopted the policy of combining the entire pipe field into a single trade. The carrying out of this policy in any particular locality is decided by vote of the members of the union's locals there, and in many places (including many large cities) the craft distinctions are observed by journeymen as fully now as in the past.

The plumbing field takes in water supply and waste plus the fixtures themselves and their "trimmings" for houses, for other buildings, and elsewhere (outdoor drinking fountains, for example). It includes many items for special uses, such as hospital plumbing fixtures, restaurant sinks, built-in dishwashers, commercial and nonportable domestic washing machines, etc.; gas piping; the public water-supply lines under streets and elsewhere; and a variety of infrequent installations (swimming pools, ornamental fountains, etc.).

The general pipe-fitting field takes in hot-water and steam heating systems (including vapor and vacuum systems), high-pressure steam plants for power generation and for steam used otherwise (as for heating of materials in manufacturing operations), sprinkler systems for fire protection, refrigeration systems for processing and storage of perishables and for air conditioning (but not the ventilating work connected with air conditioning), lines for compressed air and industrial gases, and piping for industrial processing. This last type of work is used most extensively in oil refineries, chemical plants, and food-processing plants, but occurs to some degree in many other industries.

This is a field where adeptness in the use of tools and in handling of materials, although necessary, is less important than thorough knowledge. A truely skilled workman must be familiar with a wide variety of materials and an extremely wide variety of fittings and specialties, including their particular uses, their limitations or disadvantages, and the proper methods of handling. He must know the operating principles for different kinds of systems and the operating relationships between the different parts. He must be able to lay out the system so that it fits the building where it is being installed and be able to avoid unnecessary damage to other work in any cutting that is needed. For plumbing, he must know the State laws and city ordinances so that his work will pass inspection.

For a major installation, there are separate piping drawings showing where all the pipes are to be placed, with sizes and the location of valves and other special items, thus giving a

complete picture of the installation. At the other extreme there may be no more than a verbal statement of the fixtures wanted and their approximate locations. From such information, plus measurement of the building, the journeyman or foreman decides where and how the pipes will go. Then the necessary pieces are cut to length and assembled with necessary fittings, valves, and other parts. At the end of this "roughing-in" stage, there is usually an inspection of plumbing by the city or State inspector, including a test under water pressure. When carpentry, plastering, and the other trades are far enough advanced, the job is finished by installation of the plumbing fixtures with their "trimmings" (faucets, drains, traps, etc.) or the corresponding parts of the heating system (radiators, etc.).

Examples of changes in the work within recent years are the rapid adoption of copper pipe with brass fittings for plumbing, the very recent growth of panel (frequently known as radiant) hot-water heating, and, quite interestingly, the use of copper pipe for some of the panel-heating installations. The use of welding has grown rapidly since about 1930. Many others could be cited. Even the new kinds of pipe now used (including aluminum, stainless steel, rubber-lined steel, nickel alloy, plastic, copper, and brass) suggest the active development of materials that has occurred. Such changes, combined with the exceedingly wide range in types of work included, give particular importance to over-all knowledge and an understanding of principles.

Where Employed

Most journeymen work in the construction industry, primarily on buildings but on other construction as well. Others work for municipal water departments, other utilities, and in shipbuilding. Commercial and industrial establishments also employ plumbers and pipe fitters for maintenance work and alterations, and some companies in other industries employ them for force-account construction work. They are found in almost every locality; although they are most numerous in large cities, opportunities have been increasingly good in small places because of rising standards, in village and farm sanitation.

There is at all times a considerable amount of alteration and improvement work in addition to new construction. This includes home modernization, store and office modernization, alterations and installation of new equipment in industrial plants, and preparation of business property for new occupants. Soda fountains, restaurants, even dental offices, use equipment which must be connected to water-supply pipes and waste lines. Since these are usually not at the locations where the equipment is to be placed, they must be extended.

Repairs and replacements are more important in plumbing than in many other types of work and help greatly in providing a sufficient volume of business in small localities. They are the mainstay of many of the small plumbing establishments.

Opportunities for the heating and industrial piping part of the work are more limited geographically than opportunities for plumbing. Steam and hot-water heating systems are naturally uncommon in the warmer parts of the country and in the north are most frequent in cities having many apartment buildings and nonresidential buildings. Industrial piping is greatest where the industrial operations include processing of fluids but is used to some degree in factories of many other types as well (for steam, compressed air, oil, other substances). Refrigeration and fire-sprinkler systems are installed in industrial and commercial buildings of many different types.

Training and Qualifications

A person interested in becoming a journeyman should have an interest in and the ability to master elementary physical science and be skillful at using his hands. He must learn to make clear working drawings, to read architectural and piping blueprints, and to take measurements for laying out his work. Average physical strength is needed, but no more than for several other trades. As in other building trades, at times it is necessary to work under inconvenient and uncomfortable conditions.

Generally, the trade is learned through a 5-year apprenticeship. The apprentice signs an agreement, commonly with a joint committee representing the union and the local employers, about training, related school instruction, and

wages and hours. Under the usual program, all-round training is given on the job, and an apprentice is likely to be transferred to several employers in order to get experience in different kinds of work.

At least 144 hours of classroom work are given a year, including elementary mathematics applicable to pipe work; physics, with special attention to liquids and gases, the elements of hydraulics, and heat; mechanical drawing; and theory, which includes materials, sanitation and elements of bacteriology, and piping systems. Also covered in school courses are piping drawing, shop work, and acetylene and electric welding. A new training course covering the entire piping field has been prepared by the international union. In localities where apprenticeship is for the separate trades (plumbing, steam fitting, sprinkler fitting, refrigeration fitting) rather than for the entire plumbing and pipe-fitting field, the classroom training for any of these usually omits the material dealing almost entirely with the other trades. It seems likely that in localities where the apprenticeship is for the entire pipe field, many of the apprentices on reaching journeymen status will prefer to specialize in a particular type of work whenever such jobs are available.

In some localities a journeyman's license is required for plumbing work, obtainable after satisfactory completion of apprenticeship. A master's license is very commonly required for those engaged in plumbing contracting or in self-employment on repairs and other small jobs done directly for property owners.

Outlook

Prospects for the next several years are excellent, and thereafter the outlook for those already in the trade will continue to be good. A larger than usual number of replacements will be needed during the next 5 to 10 years, to fill openings left by those who leave the trade because of death or retirement. A large part of the journeymen plumbers and pipe fitters are in the older groups, where drop-outs for these reasons are frequent.

For a considerable number of years plumbing and other pipe work have been increasing in importance in many types of building construction. This trend is almost certain to continue. It is encouraged by active development of new products and improved products carried on by a large number of manufacturers.

For houses and apartments, mere observation shows change in the general standards. Currently the high level of building cost has brought less complete plumbing installations in many houses than would have been used otherwise, but this is a temporary departure from the trend; it is not a lowering of the standard regarded as desirable. In addition to the standard bathroom and kitchen fixtures, permanently connected appliances (especially washing machines and dishwashers) have become popular enough to be regarded as a significant part of the field.

Heating is another field showing signs of expansion. For domestic heating, panel ("radiant") hot-water installations have been acceted very rapidly. The excellent results obtainable from a first-class installation seem likely to bring a noticeable increase in the use of hot-water heating. For large buildings meeting even moderately good standards, the heating installation is designed for the lowest annual cost (including fuel expense) rather than the lowest initial cost. This means a more elaborate installation than would otherwise be used and, because of improvements in the specialty products available, a more elaborate installation than would have been used some years ago.

Industrial pipe work is far from a new field, but its importance has increased steadily and seems likely to increase further. Chemical plants and others dealing with fluids are the principal users, but it is used in industries of almost all types. Means for reducing the handling of materials and supplies are emphasized in the design of modern factories, and piping is one of the important means of achieving that purpose. Internal transportation of liquids through pipes rather than in portable containers contribute to good factory housekeeping, with reduction of the accident hazard and in some cases reduction of the fire hazard as well.

The trend toward greater use of refrigeration equipment is apparent for cold storage, for air conditioning, for processing of foods and other commodities. Sprinkler work is un-

likely to increase much in importance but will continue to be needed for protection of the inflammable contents of buildings. Many disastrous fires have shown that there is no basis for the common belief that a fire cannot occur in a fire-resistive building. Fire-resistive construction protects the building from structural damage by fire and provides no combustible material to contribute to a fire, but does not remove the fire hazard to the interior finishing materials or the contents, if these are readily combustible.

A very few years ago a factory-made plumbing assembly was brought out, consisting of a frame in which was mounted the basic pipework for a house, as well as some other equipment; this was arranged for ready attachment of covering panels and fixtures. Adoption was appreciable, but production and distribution were so greatly hindered by differences in the detailed requirements of local plumbing codes that active marketing has been discontinued, at least temporarily. When greater uniformity in plumbing codes is achieved, it is possible that a similar unit may be brought out by the original manufacturer and perhaps by other firms also. This would reduce site employment but is scarcely a cause for serious concern. Assemblies of this type by their nature are suited to specific parts of the market, rather than the entire market. For large housing projects, it is doubtful whether they offer a saving greater than that potentially possible through a highly efficient site operation.

Modernization has been an important field. For domestic plumbing it means replacement of fixtures and often of supply pipes as well; in some cases rearrangement of fixtures; in other cases provision of an additional complete or partial bathroom. This work and also nonresidential modernization of plumbing will continue. Modernization of domestic steam or hot-water heating occurs in the case of extensive remodeling and sometimes for the replacement of obtrusive old-fashioned radiators; this latter has been stimulated by the development of baseboard radiators. Installation of automatic firing equipment and automatic controls is also important. Noneresidential heating modernization is always present to some degree, for the purpose of saving fuel by converting older systems to take advantage of improved steam specialties.

Repair work is traditional for plumbing. Correction of leaks, stoppages, and other mishaps can seldom be postponed, and unless very simple, these jobs are beyond the capacity of most householders and occupants of business property. Repairs are also needed from time to time on heating systems, although less frequently than for plumbing. Servicing of automatic firing equipment and refrigeration and air-conditioning equipment has, however, become an important scource of employment.

Wage Rates

Minimum hourly wage rates for plumbers and steam fitters (pipe fitters) in effect on July 1, 1948, for a number of cities and their surrounding areas are given below, according to the terms of collective bargaining agreements.

	Hourly rate	
Area	*Plumbers*	*Steam fitters*
Atlanta, Ga.	$2.50	$2.50
Baltimore, Md.	2.25	2.25
Birmingham, Ala.	2.25	2.25
Boston, Mass.	2.30	2.30
Buffalo, N. Y.	2.40	2.40
Chicago, Ill.	2.35	2.35
Cincinnati, Ohio	2.35	2.35
Cleveland, Ohio	2.37½	2.37½
Denver, Colo.	2.24	2.24
Houston, Tex.	2.37½	2.25
Indianapolis, Ind.	2.30	2.30
Jackson, Miss.	2.00	2.00
Kansas City, Mo.	2.12½	2.12½
Little Rock, Ark.	2.00	2.00
Los Angeles, Calif.	2.50	2.20
Louisville, Ky.	2.10	2.10
Milwaukee, Wis.	2.25	2.25
Minneapolis, Minn.	2.25	2.25
New Haven, Conn.	2.25	2.25
New Orleans, La.	2.25	2.25
New York, N. Y.	[1]3.00	[1]2.75
Omaha, Nebr.	2.15	2.15
Philadelphia, Pa.	2.50	2.50
Pittsburgh, Pa.	2.50	2.50
Portland, Oreg.	2.37½	2.37½
Richmond, Va.	2.00	2.00
St. Louis, Mo.	2.25	2.25
San Francisco, Calif.	2.37½	2.37½
Seattle, Wash.	2.50	2.50
Springfield, Mass.	2.20	2.20

[1] 35-hour workweek.

Although plumbing work on new construction is seasonal, repair and maintenance work makes for more regular year-round employment than in most other building trades. Commercial alterations and modernization are less seasonal than new construction.

Additional Information

For information on where to apply for apprenticeship in a given locality, write to the United Association of Journeymen and Apprentices of the Plumbing and Pipe-Fitting Industry, Ring Building, Eighteenth and M Streets, NW., Washington 6, D. C.; to the Heating, Piping, and Air Conditioning Contractors National Association, 1250 Sixth Avenue, New York 20, N. Y.; or to the National Association of Master Plumbers, 1105 K Street, NW., Washington 5, D. C.

Electricians

Outlook Summary

The prospects for this trade are good. There are likely to be continued openings for additional construction electricians for several years.

Nature of Work

Construction electricians install electric wiring and related devices, lighting fixtures, and numerous types of electrical equipment; they make the electrical connections to electrical machinery, equipment, etc., and its control apparatus. On a large job there are drawings showing the various circuits and the approximate location of outlets, load centers, panel boards, etc., plus specifications describing the materials to be used. On small jobs the electric outlets may be indicated on the general drawings, there may be a simple sketch, or there may be merely a verbal statement of what is wanted.

Whether the job is large or small, the electrician must follow the electrical laws of the State and, unless it is in a small community, the municipal electrical ordinances. For example, under most codes he installs metal boxes wherever there is to be an outlet or switch. If a conduit system is used, the wiring is enclosed in metal pipes (or conduits) connecting the metal boxes. Frequently, instead of conduit systems, wires wrapped with a continuous strip of steel ("BX") or with a flameproof fabric are used, but the codes (laws and ordinances) specify that certain minimum requirements must be met both in the material and the way it is utilized. For a high grade building, the electrical installation is better than the minimum called for by the State or municipal electrical code. Unless there is an electrical drawing showing which outlets are to be on each circuit, the electrician arranges them according to his own judgment so that the loads will be properly distributed and no circuit will have a heavier load than is suitable for the gauge (diameter) of wire used. A somewhat different class of construction work is heavy electrical installations at power plants, steel mills, and other establishments with unusually large electrical requirements. Such work is done mainly by journeymen without family responsibilities, who move to successive jobs in different localities. Other types of installations are described briefly in the paragraphs below on Outlook.

Remodeling work provides a considerable part of total employment, as does also the installation of additional business or factory equipment in existing buildings. Commercial remodeling usually means substantial changes in the electrical system, especially in store modernization. Residential remodeling and modernization also affect the electric wiring. The installation or shifting of electrical equipment in stores, restaurants, factories, etc., means extension of existing circuits or installation of new circuits to provide the necessary current and avoid overloading the old circuits. Even the smallest portable items, such as drink mixers at soda fountains, require nearby outlets and, if these are not already in place, they must be provided.

Not included among the construction electricians are stage and motion-picture electricians, electrical equipment repairmen, linemen, men working on telephone equipment, and many others working with electrical materials.

Where Employed

Construction electricians are principally employed along with the other building trades in the construction of residences, apartment buildings, stores, office buildings, and industrial plants, and in remodeling work. Some, however, work for electric utility systems, city or Federal Government departments, or

work in coal and other metal mines, manufacturing plants, and large buildings, where they install, change, and maintain wiring systems and electrical equipment. There are also various types of specialists, such as those who restrict their work to the construction and installation of electric signs.

Employment is naturally greatest in densely populated areas, partly because of the large amount of commercial and industrial wiring. However, small cities, towns, villages, and rural areas are offering more new opportunities than previously; at the end of June 1948 almost 70 percent of all farms had central-station electric service.

Training and Qualifications

A 4-year apprenticeship or, in some cases, several years as electrician's helper, is necessary to learn the trade. Picking up the trade informally through employment as a helper was fairly common at one time but is much less prevalent nowadays. The union does not recognize helpers; they are, however, still employed in some cases on nonunion jobs. In many localities an electrician is required to have a journeyman's license, for which he must pass an examination showing a well-rounded knowledge of the job and of State and local regulations. In most cities of any size and in many of the States, a man wishing to engage in electrical contracting must have a contractor's license. Men who held ratings as electricians in the armed forces usually will not qualify as journeymen without further training, but their past experience may afford an opportunity to enter the trade as advanced apprentices.

Outlook

The outlook for additional workers is good, and at the present time there are about 19,000 apprentices, according to the Bureau of Apprenticeship records; probably a considerable number of these will be employed in industries other than construction.

This is the newest of the large recognized trades, dealing with a new group of materials and a new type of work; the present stage has been reached in about two generations. Development over these two generations has been rapid and almost continuous, standards have changed, and changes are occurring at the present time. Several of these reduce the time needed for specific operations, but separately and in combination they have helped to raise the general standards of electric wiring, have encouraged modernization of obsolete or overloaded wiring in old buildings, and have tended to increase the total volume of electricians' employment.

Flexibility and provision for unforeseeable future needs are of primary importance in nonresidential buildings of almost all types, and the standards of recent years make provision for this. For factories, this flexibility is obtained by use of "bus duct" for power wiring. Bus duct consists of lengths of metal conductors supported by insulators inside a long sheet metal box, with provision at frequent intervals for easy, convenient connection of branch circuits, which can be added or changed at any time without change of the basic installation. In better grade office buildings, "raceways" are installed instead of conduit for wiring; these are fairly large sheet metal passages with closely spaced provision for outlets, installed usually just beneath the floor surface but sometimes in the ceiling or the walls. These provide almost unlimited flexibility for whatever demands may arise during the life of the building. Modernization of old wiring has been greatly aided by new insulating materials which need not be so thick as those formerly used. They reduce the overall diameter of insulated wire, and thus make it possible to replace overloaded circuits in old buildings with heavier circuits, merely by replacing the wires in the old conduits. This has given great impetus to improvement of inadequate wiring systems.

The uses of electric current continue to increase. One illustration is the continuous increase in the use of electric ranges and water heaters. These are installed in old as well as new buildings and, in each case, require a special circuit. Permanently installed electric heating panels for individual rooms were put on the market recently. While these seem unlikely to become common in the near future, they are significant in illustrating the increase in the range of current-using products available. Electrically charged dust collectors are

another fairly recent product adapting electric current to a new purpose. The employment outlook is good for any trade in which real improvement in the products (as distinct from mere novelty or style change) proceeds rapidly, and electric work is one of the trades in which this condition is met most fully.

Since most of the work is indoors, it is relatively free from interruption by bad weather, although, of course, the volume of new work in progress varies seasonally. Alteration and modernization work are less seasonal, and help to smooth out annual employment.

Wage Rates

Wage rates as of July 1, 1948, established through collective bargaining agreements for a number of cities and their surrounding areas are given in the table below.

Area	*Hourly rate*
Atlanta, Ga.	$2.00
Baltimore, Md.	2.25
Birmingham, Ala.	2.25
Boston, Mass.	2.30
Buffalo, N. Y.	2.36½
Chicago, Ill.	2.35
Cincinnati, Ohio	2.37½
Cleveland, Ohio	2.37½
Denver, Colo.	2.25
Houston, Tex.	2.37½
Indianapolis, Ind.	2.30
Jackson, Miss.	2.00
Kansas City, Mo.	2.15
Little Rock, Ark.	1.87½
Los Angeles, Calif.	2.40
Louisville, Ky.	2.12½
Milwaukee, Wis.	2.00
Minneapolis, Minn.	2.21
New Haven, Conn.	2.00
New Orleans, La.	2.00
New York, N. Y.	[1]2.50
Omaha, Nebr.	2.20
Philadelphia, Pa.	2.37½
Pittsburgh, Pa.	2.37½
Portland, Oreg.	2.00
Richmond, Va.	2.00
St. Louis, Mo.	2.25
San Francisco, Calif.	2.40
Seattle, Wash.	2.26½
Springfield, Mass.	2.20

[1] 30-hour workweek.

Additional Information

Additional information on apprenticeship may be obtained from the International Brotherhood of Electrical Workers of America, 1200 15th St., NW., Washington 5, D. C., or from the National Electrical Contractors Association, Ring Building, 1200 18th St., NW., Washington 6, D. C.

Sheet Metal Workers

Outlook Summary

The outlook for sheet metal workers is good; this has been an expanding trade, and its principal type of work is more prominent in building operations now than at any time in the past.

Nature of Work

Sheet metal workers fabricate and install a rather wide variety of building products made from thin metal sheets. The largest field is that of ventilating, with or without heating or air conditioning, but there are many additional kinds of work. This is a highly skilled trade, and should not be confused with semiskilled factory occupations in the routine production of articles from sheets or strips of metal by stamping, die-forming or other repetitive methods.

A ventilating system consists basically of a system of ducts for the supply of air and the removal of stale air throughout all or certain parts of a building, combined with a blower and other apparatus.[12] It is usually but not always combined with a heating system, and frequently with the other apparatus (for cooling, filtering, humidifying and dehumidifying) needed for an air-conditioning system. Sheet metal workers make and install the ducts, the blower, and the other apparatus except that used for heating and cooling. They perform similar work on more restricted air-moving systems, such as for removal of fumes in factories or for collection of shavings or dust at woodworking machines and elsewhere.

Hot-air heating systems (furnaces) are installed by sheet metal workers. While these are popular for detached houses, most installations are quite simple and the total volume of employment afforded is much less than that in

[12] A quite different type of ventilating system uses an individual air inlet-blower-radiator combination for each room. These are much less common than duct-type systems; their principal use is in school buildings.

ventilating work. The work consists mainly of assembling the furnace in place from factory-made parts, installing a blower and air filter if these are to be used, and installing ducts to the hot-air registers in the various rooms and to the return registers. This duct work is far simpler than that for a ventilating system, and a comparatively small range of sizes and shapes is sufficient in most cases. Hence, these are commonly bought ready-made by the contractor, although in other cases they are made in his shop. A recent development is panel-type hot-air heating in which the hot air ducts pass across and heat the ceiling, and the heated air does not enter the rooms. From an employment standpoint this new type of furnace heat is favorable, but of only moderate importance, because hot-air heating systems are a fairly small part of the trade's total work.

Sheet metal workers install metal roofing where this is used, and also metal siding. These usually come as large sheets, corrugated or else grooved for stiffening, and require no further processing beyond such cutting as is needed to fit the building. Sheet metal workers install roof gutters and (unless when soil pipe is used for the purpose) downspouts for drainage of rain water, in conjunction with all types of roofing. They make and install flashings (formed metal strips) at roof valleys, at chimneys, and elsewhere, to prevent seepage of rain or melted snow. They make and install skylights. Altogether, these roof and exterior materials are fairly important as a source of employment. Since they are exposed to the weather, they are subject to deterioration and require repair or replacement from time to time. On expensive buildings, the gutters and downspouts are usually made in the contractor's shop, but for ordinary buildings factory-made parts are frequently used. Stock design skylights, made in advance as a standard item, have become important for industrial and warehouse buildings. For the most part they are made by sheet metal workers rather than factory operatives.

Factory-made doors, window sash, frames, partitions, etc., are commonly used in non-residential buildings. Sheet metal workers frequently install these. They also install some types of concrete forms made of sheet metal, such as those for round columns and conical column heads, but these are a small part of the total work on concrete forms. Other minor fields are commercial signs and the like for theaters, stores, etc.

Some contractors make ducts and duct fittings at the building where they are to be installed, sending out the machines needed for the purpose. Others make them at a permanent shop from the drawings and measurements taken at the building. In either case, however, shop work is a basic part of the trade. Use of standard factory-made ducts and fittings for a ventilating installation, comparable to standard parts frequently used for furnace installations, has been entirely impractical to date, and it is difficult to see how this condition can change. The reason is the almost unlimited variation in conditions to be met—dimensions of the building, rate of air movement wanted, space allowed for the ducts, etc. This variation means that each installation of any size must be a specially designed and custom-made job, if it is to fit the building and perform efficiently.

Where Employed

Most sheet metal workers are employed in making and installing equipment for new buildings or for new installations in existing buildings. A very small number specialize in repair work. Apart from this work on buildings, sheet metal workers employed in small shops manufacture, often to special order, a variety of kitchen equipment, such as steam tables, dish racks, canopies, sinks, steel or copper kettles, and similar products, for hotels and restaurants. Another specialization is the coppersmith work in constructing vats and stills for breweries and distilleries and handmade fittings for marine work. But the number so employed is quite small.

Sheet metal workers are also employed in a fairly wide range of manufacturing industries, though there are only a comparatively small number in each. Probably the largest number are employed in the machinery industries, particularly those making blowers, exhausts, electrical generating and distributing equipment, food products machinery, and steam engines and turbines. Here they make and

assemble sheet-metal parts on an individual order basis—enclosures and parts for special machinery, industrial ovens, and a great many other items. This work requires the same skills, tools, and equipment as does sheet metal work for buildings, and is totally different from repetitive operations found in many factories, where one worker stamps out thousands of identical parts. During the war, the aircraft and shipbuilding industries employed large numbers of men in work with sheet metal. Many of them were trained only for quite specific operations, however, and in skill were not comparable to journeymen.

Training and Qualifications

An apprenticeship of 4 or sometimes 5 years is required, including a minimum of 144 hours per year of classroom instruction in pattern drafting, elementary mathematics, blueprint reading, estimating, basic principles of heating and ventilating, and related subjects. Workers with several years of experience as helpers sometimes become journeymen, or their equivalent, without serving a formal apprenticeship.

While it is necessary to acquire skill in the use of tools and to become adept at working from difficult positions, these qualities alone are not enough to make a person a thoroughly capable workman. This is a trade where rounded knowledge of the work being done and good elementary knowledge of the principles being followed are necessary, particularly for ventilating work. Some knowledge of the characteristics of air flow is necessary for a competent journeyman. While journeyman knowledge is much less technical than engineering knowledge, it requires thorough training and cannot be acquired casually. Even for furnace work, corresponding knowledge is needed. For example, a journeyman should be able to estimate the heat loss from each room of a house and measure the stack temperature (temperature of the combustion gases near the bottom of the chimney) and know what it means regarding heating efficiency of the installation.

Outlook

Prospects for sheet metal workers in construction are decidedly good. In addition, a number of skilled all-round sheet metal workers will be needed in the other industries mentioned above. For a number of years, both before and during the war, there were not enough apprentices in training. As a result, the present supply of skilled workers is considerably below the expected demands, and many new workers must be trained, if these demands are to be met.

The use of air conditioning in major buildings has been increasing, and further increase is very likely. It is used for improving the quality of product in manufacturing operations. While an installation is expensive and operating cost is substantial, there are many situations in which it brings an over-all saving rather than additional expense. For numerous kinds of factory operations, it improves the quality of the product and cuts down the percentage of rejects and seconds; for office work and some kinds of factory activities, it increases the efficiency of workers in hot weather. These advantages are being more widely recognized. Its effectiveness in attracting and retaining customers in hot weather for retail establishments, restaurants, and amusement places is of course already well known. True air conditioning is not on the horizon as a common feature in ordinary houses, however, because of the initial cost; "winter air conditioning," "air conditioning heat," and similar expressions used for domestic heating systems mean merely a hot-air furnace with a blower and frequently with some sort of air filter and rudimentary humidifying apparatus.

Ventilating installations without air conditioning may increase also, though already widely used. Other parts of the field are unlikely to change enough for an important effect on total employment.

Wage Rates

Wage rates established by collective bargaining agreements for a number of cities and their surrounding areas are given in the table below as of July 1, 1948.

Area	Hourly rate
Atlanta, Ga.	$1.85
Baltimore, Md.	2.25
Birmingham, Ala.	1.90
Boston, Mass.	2.15
Buffalo, N. Y.	2.25
Chicago, Ill.	——
Cincinnati, Ohio	2.12½
Cleveland, Ohio	2.25
Denver, Colo.	2.00
Houston, Tex.	2.37½
Indianapolis, Ind.	2.12½
Jackson, Miss.	1.60
Kansas City, Mo.	2.30
Little Rock, Ark.	1.50
Los Angeles, Calif.	2.15
Louisville, Ky.	1.95
Milwaukee, Wis.	2.00
Minneapolis, Minn.	2.15
New Haven, Conn.	2.00
New Orleans, La.	1.87½
New York, N. Y.	[1]2.75
Omaha, Nebr.	1.87½
Philadelphia, Pa.	2.50
Pittsburgh, Pa.	2.50
Portland, Oreg.	1.95
Richmond, Va.	1.87½
St. Louis, Mo.	2.50
San Francisco, Calif.	2.12½
Seattle, Wash.	2.21½
Springfield, Mass.	2.20

[1] 35-hour workweek.

Additional Information

For additional information about this trade, write to the Sheet Metal Workers' International Association, Transportation Building, Washington 6, D. C., or to the Heating, Piping, and Air Conditioning Contractors' National Association, 1250 6th Avenue, New York 20, N. Y.

Elevator Constructors

Outlook Summary

The outlook for elevator constructors is, and should continue to be, very good. This is a small trade, however, and so the number of openings for additional workers in a city at any time will be small. Because of maintenance and modernization work, seasonal regularity of employment is better than for almost all of the other trades.

Nature of Work

Elevator work is essentially the assembly in place and adjustment of machines for vertical transportation of passengers and freight, using factory-made subassemblies and parts.

These are principally elevators, but include small units for light freight service (dumbwaiters), moving stairways, and a number of specialized devices which are useful for specific purposes but not common enough to be important as a source of employment. Ordinarily all real fabrication is done at the elevator company's factory, or (in the case of some of the smaller companies) at factories from which it buys parts, or at which it has custom shop work performed.

The entire installation is treated as a related whole and is not divided among several trades on the basis of the materials from which the various parts are made. An elevator job starts with the shaft opening, usually with all adjoining shafts enclosed by a surrounding partition. The work is done by teams, each consisting of an elevator constructor and a helper. They first install the guide rails for the car and the counterweight. They install the car frame and platform, the counterweight, the machine itself, and the control apparatus, and connect the car frame to the counterweight with cables (wire ropes) which pass over the sheaves at the top of the shaft. Other parts of the installation are the cab body and roof, the cab door, and the control wiring. If there is mechanical operation of doors, the operators and control apparatus are put in by the elevator constructors. The job ends with careful adjustment and testing. A moving stairway installation is entirely different in the type of materials and the manner of assembly but is the same in being handled as a whole by a single group of workers.

Maintenance and repair work is important. This consists of thorough inspection, periodical replacement of cables, adjustment of worn parts (brake surfaces, contact surfaces in the control apparatus), and replacement of worn parts as necessary. Commonly, it includes periodical lubrication and adjustment.

Modernization of elevator installations has also been important for a number of years, because of the rapid rate of improvement. This is quite similar to a partial new installation, in many cases using the old rails, car frame, platform, and counterweight, but replacing almost everything else.

Where Employed

Elevator constructors are employed almost entirely in the construction industry, mainly by elevator contractors whose principal business is new installations and modernization. For the most part these firms operate nationally or regionally, but a number of them are active within smaller territories. Some workers are employed by small local contractors specializing in maintenance and repair, and in some cases doing an occasional new job. A small amount of maintenance and repair is done on essentially a self-employment basis. There is also a certain amount of employment by city building departments and similar organizations as elevator inspector. Force-account employment for maintenance is very slight; the work is so specialized that few property owners find it economical to employ a journeyman regularly.

Training and Qualifications

While this is unquestionably one of the more highly skilled trades, training is comparatively informal and is obtained through employment as a helper for a number of years. Among the principal requirements for a young man wishing to enter the field are mechanical aptitude and an interest in machinery. Assignments at first are to simple jobs which can be done without experience and to work done directly with the journeyman.

It is necessary to acquire fairly extensive knowledge during this period as a helper—detailed knowledge of the many different kinds of circuits used in present-day and old installations, the many different kinds of mechanical arrangements that have been used, the proper sequence of actions in making adjustments, interpretation of symptoms of faulty adjustment, indications of needed replacements in the parts most subject to wear, and many other subjects. In addition, of course, it is necessary to become adept in the use of tools and in the particular operations involved.

Outlook

The outlook for elevator constructors is very good and seems likely to remain so. This is probably an expanding trade but from its highly specialized character will never be able to take any large number of entrants at one time.

Standards of elevator service have been rising steadily, largely as a result of the noteworthy improvements made over a period of years by the large companies and by some of the other companies also. Concentrated attention has been given to elevators from the standpoint of traffic flow. Architects and property owners recognize that under many conditions an installation embodying recent improvements is economical over the life of a new building, even though the initial cost is greater than for a simpler installation. These improvements tend to increase employment in three respects. On the average, new installations are more highly developed (in a sense, more elaborate) than was the case some years ago, requiring more work for installation and initial adjustment; the improvements over the elevators in sound buildings constructed 30 years ago or more (and in many sound buildings constructed more recently) are so great that modernization is greatly encouraged, to bring the buildings up to current standards and in some cases to bring operating economy as well; and the maintenance needed is obviously greater for an installation with automatic door operations, automatic leveling at the floors, etc., than in older installations without such features.

The market for moving stairways has been increasing also; their value in handling very heavy passenger movement of a few stories without congestion and their low operating cost have been recognized by property owners and architects as offsetting their fairly high initial cost. The early public attitude of doubt about the passengers' safety, although groundless, was somewhat widespread. This has been succeeded by appreciation of their convenience, so that in many types of buildings they are expected. A very large number have been installed within recent years in old buildings—department stores, railroad stations, other buildings. The two largest manufacturers have brought out less expensive models suited to a fairly wide range of conditions, although not to all conditions for which the older models can be used, and another firm has brought out a fairly new line intended for a lower-price

market. These are likely to widen the field of use.

The trade of elevator constructor is urban but is not confined to the largest cities. One of the elevator companies has offices in about 250 cities, some of which had a 1940 population well below 50,000, and a few of which were below 25,000. Some of the moderately large regional companies also have branch offices, and there are many small local firms for maintenance and repair in cities of moderate size.

The work is almost entirely indoors, and in most cases a particular job continues steadily over a period of at least a few weeks. It is not subject to weather interruptions, and intermittent lost time while other trades perform related work is not a serious matter. Modernization, repairs, and maintenance smooth out seasonal irregularity of employment very greatly. There are probably a few opportunities for self-employment and for establishment of small contracting businesses in maintenance and repair work. Establishment of a contracting business primarily for new work cannot be termed impossible for a journeyman and has been done successfully in the past—in one case with the most conspicuous success. Nevertheless, the capital requirements and other considerations make this one of the decidedly difficult contracting fields to enter.

Wage Rates

Below are wage rates for elevator constructors and for elevator constructors' helpers in effect on July 1, 1948, for a number of cities and their surrounding areas, as established by collective bargaining agreements.

Area	Hourly rate: Elevator constructors	Hourly rate: Elevator constructors' helpers
Atlanta, Ga.	$2.00	$1.40
Baltimore, Md.	2.18	1.53
Birmingham, Ala.	2.03	1.42
Boston, Mass.	2.17	1.52
Buffalo, N. Y.	2.41½	1.69
Chicago, Ill.	2.38	1.66½
Cincinnati, Ohio	2.39	1.67
Cleveland, Ohio	2.37½	1.66
Denver, Colo.	2.22	1.50
Houston, Tex.	2.17½	1.52
Indianapolis, Ind.	2.33½	1.63½
Little Rock, Ark.	1.87½	1.31½
Los Angeles, Calif.	2.25	1.57
Louisville, Ky.	2.16½	1.51½
Milwaukee, Wis.	2.15	1.50½
Minneapolis, Minn.	2.21	1.55
New Haven, Conn.	2.41	1.69
New Orleans, La.	2.00	1.40
New York, N. Y.	2.75	2.03½
Omaha, Nebr.	2.18	1.53
Philadelphia, Pa.	2.58	1.81
Pittsburgh, Pa.	2.56½	1.79½
Portland, Oreg.	2.24½	1.59
Richmond, Va.	2.10	1.47
St. Louis, Mo.	2.30	1.61
San Francisco, Calif.	2.37	——
Seattle, Wash.	2.32	1.62⅜
Springfield, Mass.	2.25	1.59

In considering the helpers' rates, it must be kept in mind that they are in a sense informal apprentices, with the expectation that in time they will advance to journeyman status.

Additional Information

For additional information, or the address of the nearest union local, write to the International Union of Elevator Constructors, 12 South Twelfth Street, Philadelphia 7, Pa.

Building Laborers and Hod Carriers

Outlook Summary

The outlook for laborers in building construction is fairly good; in other types of construction their outlook is better, and these are the types likely to be best sustained, or even expanded, during a reduction in private building construction and general economic activity. The outlook on the whole seems better than that of a few of the skilled trades but not as good as that of the others. In building construction particularly and to a smaller degree in other construction, laborers' employment has been reduced by developments in machinery and methods. There are some opportunities, however, for advancement to classes of work involving a considerable degree of skill and having higher wage rates and better employment prospects.

The outlook for hod carriers (bricklayers' tenders and plasterers' tenders) is probably about equal in each case to that of the trade which they serve.

Nature of Work

Building laborers and corresponding laborers on other types of construction (highways,

sewer and water projects, engineering construction, etc.) do work which requires no formal training. Laborers' work is commonly known as unskilled, but this term can be misleading. The work covers a wide range in its requirements; in most of the operations experience is valuable, in some of them it is necessary, and experienced laborers have a large fund of knowledge of methods and working conditions.

One type of work is hand excavating, for footings, small trenches, and other places where a machine cannot be used or is not economical. This work is a good illustration of the proficiency gained by experience. Anybody can dig a hole for a footing, but without experience he will have serious difficulty in preventing excess size and in getting a firm and reasonably level bottom. This is not skilled work; neither is it work which can be done efficiently by a strong but completely inexperienced person. Other work is hand backfilling and grading, and conveying of materials by carrying or by wheelbarrow, handcart, etc. Laborers move the smaller units of machinery and equipment. They set bracing in place to prevent cave-in of trenches, and drive sheet piling at the sides of excavations, unless a power pile driver is used. Where concrete is mixed at the job, they charge the mixer with ingredients, and in any case place the concrete, spread it out, and spade it to prevent air pockets. They do the general cleaning up and removal of rubbish at successive stages of the job. In alteration and modernization jobs they tear out the old work and then perform the operations that they would on a new building.

In nonbuilding construction laborers do comparable work, and usually form a much larger part of the crew than in most building projects. In highway work and also in heavy engineering work, there are numerous jobs generally similar to those done in building, although not exactly the same. A few examples in concrete highway paving are handling and placing the side forms which also act as rails for the strike-off machine and finishing machine; setting up and moving hose lines to supply the mixer with water; covering the new pavement to prevent excessive drying during the curing period. A fairly large volume of employment is cutting through city pavements for underground utility work, excavating for whatever is to be done, backfilling and tamping, and replacing the pavement; there is also extensive employment in track maintenance for streetcars, where these are used. On the whole, individual jobs last longer than in building construction.

The work of masons' tenders and plasterers' tenders has already been mentioned in the sections on bricklayers and plasterers. These men serve the journeymen of their respective trades, supplying them with materials, setting up and moving portable scaffolding for them, and providing the other services needed for performance of the journeymen's work. These duties require familiarity with the work of the journeyman, limited knowledge of the materials used, alertness, and some degree of judgment.

A number of other types of work are done also, including demolition of ordinary buildings and many other structures, excavation through rock, application of "gunite" (a cement-sand mixture sprayed into place by compressed air), and all operations carried out under compressed air. These last occur mainly in construction of tunnels and caisson foundations. These special jobs are almost always regarded as quite distinct from the work of building laborers, require specific on-the-job experience, and carry higher pay rates. The men working under compressed air must pass quite rigid physical examination. They do all the work back of the air lock, including operations which would be done by journeymen if located elsewhere; some of these men, such as those doing blasting, have very serious responsibilities.

Where Employed

Laborers and tenders are employed primarily in the construction industry but are also employed in many other industries for force-account construction and maintenance. Large numbers are hired by public bodies (public works departments, highway departments, etc.) and by public utility companies. Those in special fields are employed almost exclusively by contractors specializing in particular types of work—demolition, tunnel work, etc. Factory laborers are usually regarded as quite distinct from building laborers.

Training and Qualifications

Training for these occupations is obtained on the job. Laborers enter the construction industry by getting a job, plus obtaining membership in the union if they are working on union projects. Contractors naturally prefer experienced workers, and this first job is usually on the simplest type of work. Experience as a laborer is the usual background for bricklayers' and plasters' tenders and for men in other special fields. New workers for jobs done under compressed air (tunnels, caisson foundations, etc.) are ordinarily chosen from men having experience in above-ground employment at similar projects.

Outlook

In considering the outlook, the range of work done and the range of individual abilities must be kept in mind. Experienced men are proficient in a wide range of operations, know construction practices, and understand conditions that they encounter, such as the stability of types of earth they encounter in hand excavating. Such men are, of course, employed more steadily than those with little experience. However, the field of work has been reduced by mechanization, and this process is still going on.

Unless when there is strong, effective union organization, the labor force is subject to expansion during an employment drop in other industries. While not equal to experienced building laborers, these potential workers constitute an employment threat because there are some jobs that they can do well, and some others for which they can obtain the necessary experience within a fairly short time. Hence wage rates for nonunion laborers can drop sharply and rapidly during a period of general unemployment.

There is a considerable amount of lost time because much of the work is outdoors, where it is interrupted by bad weather, and because of the seasonal nature of many kinds of construction. There are numerous long jobs for experienced, capable laborers, but there are also many brief jobs. Not uncommonly men are hired for a few days or even a few hours, for pouring of a concrete slab or some other peak requiring more men than the regular crew.

Because of the importance of physical strength in many operations, the employment situation is likely to be less favorable for laborers than for journeymen as they become older. There are, however, a fair number of steady jobs for elderly laborers whose main employment assets are dependability, good judgment, knowledge of construction operations, and adeptness at the types of work for which experience is most important.

An extreme illustration of reduced employment through mechanization is given by the mixing and placing of concrete. Although mixers had been available for a number of years, concrete was often mixed by hand until about 40 years ago. This work was done by laborers. Since then, hand mixing has decreased greatly in extent and now is seldom used except for very small quantities. When mixers were used, the laborers charged these, measuring the sand and gravel into wheelbarrows and emptying these into the drum or into a loading skip; the work of mixing had been abolished. Then came overhead bins for storage and measurement of aggregates, used on large jobs, and most of the work of charging the mixer on such jobs had been abolished. Then came ready-mixed concrete, and the entire set of mixing operations had been abolished. The mixed concrete was transported in wheelbarrows at first, but on jobs of moderate size these were replaced at an early date by buggies (two-wheeled carts) which carried much more and cut down the work involved. Until fairly recently, concrete above ground level for buildings was hoisted in a tower and emptied into a hopper, from which it was wheeled to the places wanted. This hopper was at one side of the building. Now this has been supplanted in many cases by hoisting in a bottom-dump bucket operated by a crane, and when it is at the proper height swung to a location over the floor. This cuts down even the wheeling needed, leaving mainly depositing the concrete, spreading it, and spading it.

Employment of bricklayers' tenders and plasterers' tenders at any job bears a fairly regular relationship to that of bricklayers or plasterers and does not have the brief peak of many kinds of laboring work. Their types

of work and the conditions under which it is done make it much less suitable for further mechanization. It is customary practice for tenders to be transferred from one building to the next along with the journeymen. The situation for laborers in nonbuilding work (paving and most types of heavy construction) is also better than that of laborers on buildings.

Experience as a laborer is the customary background for tenders and for those in special fields such as caisson and tunnel workers. While not a preparation for any of the skilled trades, it may lead to an opportunity for apprenticeship. Cases are known in which contractors have operated semiformal training programs, hiring inexperienced young men as laborers, advancing them to helpers, and ultimately advancing them to journeymen.

Wage Rates

Below are wage rates for building laborers, bricklayers' tenders, and plasterers' tenders established by collective bargaining agreements, and in effect on July 1, 1948, in a number of cities and their surrounding areas.

Area	Hourly rate		
	Building laborers	Bricklayers' tenders	Plasterers' tenders
Atlanta, Ga.	$0.90	$1.00	$1.00
Baltimore, Md.	1.25	1.35	1.35
Birmingham, Ala.	.95	.95	1.00
Boston, Mass.	1.55	1.55	1.70
Buffalo, N. Y.	1.65	1.65	1.75
Chicago, Ill.	1.70	1.70	1.82½
Cincinnati, Ohio	1.46	1.66	1.66
Cleveland, Ohio	1.72½	1.72½	1.72½
Denver, Colo.	1.40	1.75	1.75
Houston, Tex.	1.07½	1.27½	1.27½
Indianapolis, Ind.	1.37½	1.57½	1.57½
Jackson, Miss.	.80	.90	.90
Kansas City, Mo.	1.47½	1.65	1.65
Little Rock, Ark.	.80	1.25	——
Los Angeles, Calif.	1.48¾	1.75	2.20
Louisville, Ky.	1.25	1.50	1.50
Milwaukee, Wis.	1.55	1.65	1.82½
Minneapolis, Minn.	1.45	1.55	1.95
New Haven, Conn.	1.55	1.55	1.55
New Orleans, La.	.92½	1.02½	1.12½
New York, N. Y.	[1]1.95	[1]1.95	[2]2.10
Omaha, Nebr.	1.20	1.20	1.32½
Philadelphia, Pa.	1.25	1.25	1.77½
Pittsburgh, Pa.	1.50	1.75	1.75
Portland, Oreg.	1.52½	1.77½	1.77½
Richmond, Va.	.90	1.15	——
St. Louis, Mo.	1.50	1.80	2.00
San Francisco, Calif.	1.52½	2.25	[3]2.10
Seattle, Wash.	1.66½	1.91½	1.91½
Springfield, Mass.	1.25	1.50	1.50

[1] 35-hour workweek.
[2] 30-hour workweek; $2.40 in Brooklyn.
[3] 30-hour workweek.

Rates for those doing special types of work are higher in most localities, and for the most part these men are recognized as separate occupational groups. The higher rates common for work under compressed air are a reflection of the exacting physical requirements, the discomforts, and the occupational hazards of such work.

Additional Information

For additional information, write to the International Hod Carriers', Building and Common Laborers' Union of America, 821 Fifteenth Street NW., Washington 5, D. C.

PART III

THE GEOGRAPHICAL DISTRIBUTION OF CONSTRUCTION EMPLOYMENT

It has already been pointed out that total construction employment can be predicted only in relationship to over-all business activity. Prospective employment in construction is even more uncertain for any given locality than for the country as a whole.

First of all, the geographical distribution of construction operations is governed by demand on the part of owners[1] rather than by fixed plant of the construction industry. The bulk of the industry's plant and equipment is portable, used at the job, and is at contractors' warehouses or yards only when not in use. All common kinds of construction machinery are widely distributed throughout the country and uncommon specialized machines are shipped several hundred miles between jobs when necessary. Shop equipment of the special trade contractors remains in their shops, but the products can be and are shipped as far as is necessary. In the case of shop fabrications for which only a few contractors are prepared (because the work is unusually large, or in a highly specialized field, or requires technical or artistic services which only a few leading firms can provide) these contractors operate over a very wide area, frequently shipping their shop-made materials to jobs as much as 500 to 1,000 miles away.

For a comparatively small area it is possible to state what past construction has been, what the current construction rate is, and what the trend for such areas in the same general part of the country seems to be. It is not possible to make a forecast for such an area on any other basis than guessing, because of the great importance of large individual projects. Within fairly recent years a building project was carried out in New York City for quite unpredictable reasons, large enough to have marked influence on total construction employment in the entire city. At about the same time there was a similar case in Chicago, entirely unrelated to the New York project. The effect of outstanding individual projects is, of course, proportionately much greater in smaller places. In contrast, there have been announcements of quite definite and exceedingly large building projects for a number of the leading cities, made by financially responsible operators with a background of notable success in less ambitious undertakings, which have either gone ahead on a far smaller scale than announced or been temporarily abandoned with slight apparent likelihood of revival.

Almost without exception individual projects are unpredictable. Expansion plans of industrial and commercial establishments and plans for replacement of obsolete buildings are highly elastic, and final decisions are seldom made until shortly before the awarding of contracts. This is well illustrated by the action of a nationally known manufacturing firm having plants in many parts of the country, which some years ago undertook an expansion program. It contemplated construction of an unusually large building at its home plant, proceeding to the stage of having detailed architectural and engineering drawings prepared and of receiving contractors' bids. Then it changed its program drastically, abandoned this project, modernized a plant several hundred miles away, bought existing plants in distant parts of the country, and remodeled them extensively to fit its own standards of plant lay-out and facilities. While extreme, this instance indicates that expansion of an industry or an individual firm does not necessarily mean construction at a given place.

Technical developments in industrial processes or in the use of basic materials can have great influence on construction, in part directly through bringing about construction of appro-

[1] This demand includes the expected sales or rental demand for the product of builders, as well as the known demand of property owners who authorize contractors to proceed with construction.

priate industrial facilities, and in larger part indirectly through the economic stimulation of large areas. The rayon industry is one example. Another is the process whereby satisfactory newsprint and other paper can be made from fast-growing types of pine trees in the South. The direct construction and the general stimulating effect resulting from this treatment for wood pulp are still in process and seem likely to continue for several years.

Developments with long-range importance to the geographical distribution of industrial activity and, hence, of population and construction, were announced in late summer of 1948 by the steel industry. The principal of these is a new method in which molten steel is cast directly from the furnace into semifinished shapes, ready for the later rolling and finishing stages; the earlier stages of casting the steel into ingots and reducing these to semifinished shapes are omitted. This eliminates need for some of the heaviest and most expensive equipment and cuts down sharply the investment needed for a steelmaking plant. Industry sources think it likely that over a period of years new plants using this process will be built in several parts of the country distant from the leading steel centers. If so, in each case industrial and other developments will be stimulated over an extensive area, urban population will increase, and construction activity of almost all types will be accelerated. Conservation and development programs likewise have a stimulating effect through increasing the area of land suitable for farming and increasing the extent of industrial development. The increase in construction employment for local journeymen may be even greater following completion of a conservation project than during its execution.

An indication of the sometimes erratic distribution of construction may be seen from summaries of urban building activity. A summary of the leading places in all construction and in each of several types of 1947 was prepared by the Bureau of Labor Statistics on the basis of building permits issued and Federal contracts awarded during the year. Eight cities each had a total permit valuation of 50 million dollars or more. As might be expected, these included all 5 cities with 1940 population of 1,000,000 or more; but there were not any of the 9 cities with population of 500,000 up to a million, there were 2 of the 23 with population of 250,000 up to 500,000, and 1 of the 55 with population of 100,000 up to 250,000. This group of leading cities varies from year to year, and in some years does not include even all 5 of the million-or-over cities.

For individual types of building, some of the leading places in 1947 are quite surprising. The sixth place in rank for the entire country for the construction of factories and workshops was an unincorporated urban township in New Jersey with 1940 population under 20,000. The third city in rank for office and bank buildings and also the second in rank for public buildings was an inland city in northern Florida of about 16,000 population. Two of the seven leading cities for institutional buildings had 1940 populations of 50,000 up to 100,000, and a third was below 25,000.

Obviously all of these small places were in positions of leadership because of a very few remarkably large projects—in most cases, a single project. Such construction is occurring constantly in small places but infrequently in any one place. A single modern hotel is ordinarily all that the market will support in a city of 10,000 to 25,000; once built, it will probably not be replaced for at least 50 years, and a competing hotel is unlikely to be built until advances in design, materials, and equipment have made the existing hotel at least partly obsolete—a matter of decades rather than years. The same is true of other major buildings.

This section deals mainly with the general construction prospects for each of the country's geographic divisions[2], with separate material on individual States where these differ substantially from the remainder of the regions in characteristics affecting the construction outlook. For each geographic division there is a very brief statement of its economic background, its recent construction and population trend, and an evaluation of its construction prospects. Regional forecasts of construction expenditures or construction employment are not offered; numerical forecasts on a national basis more than

[2] Geographic divisions are regions established by the Bureau of the Census, each consisting of a number of adjoining States. There are numerous other systems of regional classification, each having definite advantages from the standpoint of one or more specific industries, but the geographic divisions are the most satisfactory for an over-all consideration.

a year in advance are regarded as exceedingly tentative by all responsible construction economists and statisticians, and from their nature regional forecasts are subject to much greater uncertainty than are national forecasts. Instead, the intention is to present an evaluation of the relative positions in economic development of each of the geographic divisions, the changing status of the divisions, and the conditions by which construction activity within each seems likely to be influenced most strongly.

The comment that a particular division has reached a stage of economic maturity and is likely to have a smaller part of national construction expenditures than in the past means only what it says, and not that construction activity has been almost completed in this part of the country. Construction operations measured in dollar value or in physical terms may actually increase, but the increase will be less rapid than in parts of the country which are in a stage of rapid industrial growth. There will be much less need for housing of additional families or for provision of additional industrial and commercial plants than in rapidly growing parts of the country. There can, however, be an exceedingly active market for additional housing and improved housing for a relatively stable population, for new industrial facilities to replace older plants which have become obsolete, for plants to produce new types of products, and for buildings in the nonprofit category (public buildings, hospitals, churches, others) for which ordinarily the standards are highest in mature localities.

On the whole, construction employment within any geographic division is concentrated in and around its larger cities—particularly within its metropolitan districts.[3] This does not necessarily mean that employment prospects are best in such localities, because construction workers are similarly concentrated within them. Where one lives and works is a matter of preference, which can be exercised more freely by construction workers than by workers in most other fields. There are opportunities in comparatively small cities and in villages. A person preferring living conditions in a large metropolitan center should certainly choose such a locality, but it would be a serious mistake for a young journeyman who prefers the particular advantages of a city of 5,000 or a village of 1,000, to attempt to migrate to one of the larger cities just because more members of his trade are employed there. He should keep in mind that there are also more members of his trade available for employment in such a city. The very great improvement in rural and, particularly, farm housing conditions, the extension of rural electrification, the startling increases since 1940 in farm plumbing, mean that there has been an exceedingly active market for the services of skilled construction workers in small localities. It can be expected confidently that this will continue, unless there should be a serious drop in farm income. Members of the less common trades must, of course, live within commuting distance of a city large enough to have a contractor in their field.

The section on each geographic division is accompanied by a table giving an estimate of expenditures in 1939 and also in 1947 for total construction, for private residential building (nonfarm), for private nonresidential building (nonfarm), and for total publicly financed construction, for the geographic division and for each State. It also shows these expenditure figures as a percentage of the corresponding national total. The source of these estimates is the pamphlet "State Distribution of Construction Activity, 1939-47," published by the Construction Division of the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, as a statistical supplement to the June 1948 issue of its monthly publication "Construction and Construction Materials."[4]

These tables are in terms of dollar expenditures in each of the respective years, without adjustment for the increase in construction costs over the period. Such adjustment would be highly desirable but cannot be made because there are no satisfactory regional or State cost indexes for most of the important types of con-

[3] Metropolitan districts are areas defined by the Bureau of the Census, each consisting of a central city having 1940 population of 50,000 or over (in some cases, two or more nearby cities of such population) plus the surrounding places extending outward as far as population density is 150 per square miles or over. They are essentially tools for the study of population, employment, markets, etc., and are not units of local government. It is reasonably accurate to regard them as containing that part of the total population which is influenced substantially by the environment of a large or moderately large city.

[4] Estimates of expenditures by State for 1948 are only partially available; because of curtailment in the collection of field data, information was insufficient for individual estimates of 1948 expenditures for private residential building (and hence for total construction) for 25 of the 48 States.

struction. The generally accepted indexes of construction costs, both national and local, are suited to their intended purposes but not to the adjustment of State construction activity.

Expenditure increases from 1939 to 1947 as shown in the tables do not mean a corresponding increase in the physical volume of construction. This is not a serious defect for the comparisons which are made, however, because these are on two bases for which unadjusted figures are reasonably satisfactory: (1) Geographic divisions or State expenditures as a percentage of the national total, and (2) percentage increase in geographic division or State expenditures as compared to percentage increase in national expenditures.

It is recognized that estimates of construction expenditures of the various States are, by their nature, less reliable than for the United States as a whole. It is also recognized that comparison between two individual years has serious shortcomings and that an apparent trend indicated by such comparison cannot be extended into the future by mere mechanical computation. These estimates are, however, quite the best available and are presented along with other material as an indication of the relative importance of the different parts of the country with respect to construction and of the effect of some of the economic forces mentioned in the text.

NEW ENGLAND STATES

Summary

Employment prospects in construction are fairly good, although less in proportion to population than in newer parts of the country. Activity will probably be greatest in the durable-goods area (most of Connecticut, western Massachusetts), lower but more stable in the remainder of southern New England, and comparatively small in the three northern States (Maine, New Hampshire, and Vermont).

Background

There are six New England States—Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island. Although the region is commonly referred to as a single homogenous unit, actually the northern States (Maine, New Hampshire, and Vermont) follow an economic pattern quite different from that of the three States to the south. The northern States are predominantly agricultural: Lumbering, farming, and vacation resorts are the principal industries. In contrast, Massachusetts, Connecticut, and Rhode Island are highly industrialized, with about 40 percent of the labor force engaged in manufacturing.

New England is one of the most highly urbanized sections of the United States. Close to 70 percent of the population is concentrated in metropolitan districts, as compared with 48 percent for the Nation as a whole. The industrial States are by far the most populous. Massachusetts, Connecticut and Rhode Island, with only 22 percent of the total land area in the region, have approximately 80 percent of the population. All of the metropolitan districts in the region except Portland, Maine, and Manchester, New Hampshire, are located in the industrial States, and Manchester, near the Massachusetts border, may be regarded as the northern tip of industrial New England.

Industrial New England may be broken down into two main areas. In the eastern part—from Manchester, New Hampshire, down to Providence, Fall River, and New Bedford — soft goods industries predominate. Boston, Massachusetts—the largest New England city—is an important seaport and a wholesale and retail distribution center. Although manufacturing in and around Boston is quite diversified, the emphasis is on soft goods. Other areas in this section of New England—Fall River-New Bedford, Providence-Lowell-Haverhill, and Worcester — are textile and shoe manufacturing centers.

In the western part of industrial New England, manufacturing is concentrated on metal products, metal machinery, and other heavy goods. This area extends from Springfield, Massachusetts, southward to New Haven, Bridgeport, and Waterbury, Connecticut.

New England at one time was the center of wealth and industry for the entire Nation. But many years ago, as new areas in other sections of the country were developed, this region

ceased to be dominant in population, income, and industry, and New England's relative importance has declined gradually. Although the region has continued to grow all along, newer industrial areas—particularly in the South and West — have been growing at a faster rate. Some years ago a considerable part of the region's two most important industries—textiles and shoes — moved to other sections of the country, and the gap has been filled only partially. Moreover, this migration may not yet be completed. However, the region has been gaining in heavy goods industries while losing soft goods. The metal manufacturing industry, for instance, which has made considerable headway since 1939, has proved to be a very substantial replacement for the drop in consumer goods industries.

Postwar Construction

In 1947, new construction expenditures in the New England States amounted to approximately 702 million dollars. The three industrial States accounted for 85 percent of the total regional bill—Massachusetts alone for one-half. New construction in the three rural States combined was valued at only 104 million dollars, and the State of Maine accounted for almost half of this sum. A little over one-third of the total regional construction bill (or about $245,000,000) was spent for private nonfarm housing and not much less than a third for private nonresidential building (office buildings, stores, factories, etc.). Approximately one-fifth of the total consisted of various kinds of public construction projects.

Construction activity in the New England States is considerably higher now than before the war, as measured in expenditures. The dollar volume of new construction in 1947 was almost twice that of 1939. However, the 1947 construction volume was only 5.0 percent of the national total, whereas in 1939 it was 5.8 percent. Every State in New England showed a relative decrease except Vermont, which returned to its prewar position.

New England's loss in relative share of construction is to some extent associated with long-range trends in population and employment. Any increase or decrease in population can cause a change in the demand for construction and, for New England as a whole, the rate of population increase has been on the decline for a number of years. In the 20-year period 1920 to 1940, New England's population dropped from 7.0 to 6.4 percent of the national total. Census estimates indicate that in July 1948, civilian population of the region was 10.1 percent above 1940, as compared with a national increase of 10.6 percent. Two States showed increases above the national average—Connecticut (17.6 percent) and New Hampshire (11.2 percent).

Inter-State migration and intra-State shifts in population from rural to urban areas cause an immediate change in the tempo of construction activity. New homes, recreation facilities, etc., are needed to accommodate the inflow of people, and new industrial plant facilities are usually required. Thus, we have a shift in the distribution of construction with the industrialization and urbanization of heretofore rural areas in the South and West. New England, already highly urban and industrial, does not have the same need for added living space and facilities as the new industrial areas, and so has declined relatively in total new construction activity.

The Future

Prospects are that construction in New England will continue at high levels for at least the next several years. As in the past, construction will be concentrated in the industrial States, the bulk of it in Massachusetts—by far the most populous State. Building will be most active in the areas which produce metal products and other durable goods. Connecticut, in particular, should come in for a larger share of construction.

In the long-run, soft goods—still the mainstay of a good many New England towns—will help to keep business on a relatively even keel. To illustrate, the demand for soft goods is fairly steady; people buy food, clothing, and shoes in bad times as well as good. Consequently, in a boom period, the region is likely to make less of a spectacular showing than other sections of the country and by the same token it is likely to fare better in depression times.

Another factor affecting the volume of con-

Table 11.—*Estimated expenditures for new construction, 1947 and 1939*

Region and State	Total new construction		Private residential building		Private nonresidential building		Public construction	
	1947	1939	1947	1939	1947	1939	1947	1939
	[Millions of dollars]							
New England	701.5	363.9	244.6	105.8	202.5	57.3	136.3	148.2
Maine	47.0	22.7	10.9	4.2	9.7	2.7	17.6	10.5
New Hampshire	33.6	20.6	10.9	4.6	7.2	2.7	5.5	8.6
Vermont	23.4	11.2	5.0	2.3	3.4	1.8	7.6	4.6
Massachusetts	368.1	169.4	136.8	49.3	114.5	26.6	57.4	70.6
Rhode Island	59.6	33.4	30.3	10.3	12.6	5.0	9.3	14.2
Connecticut	169.8	106.6	50.7	35.1	55.1	18.5	38.9	39.7
	[Percent of U.S. total]							
New England	5.0	5.8	4.7	5.0	6.5	7.2	4.4	5.9
Maine	.3	.4	.2	.2	.3	.3	.6	.4
New Hampshire	.2	.3	.2	.2	.2	.3	.2	.3
Vermont	.2	.2	.1	.1	.1	.2	.2	.2
Massachusetts	2.6	2.7	2.6	2.3	3.7	3.4	1.9	2.8
Rhode Island	.4	.5	.6	.5	.4	.6	.3	.6
Connecticut	1.2	1.7	1.0	1.7	1.8	2.4	1.3	1.6

Source: U. S. Department of Commerce, Construction and Construction Materials, Statistical Supplement, June 1948, tables I, II, and III.

struction is the relative maturity of the New England region. Although the Nation as a whole has gone a long way toward economic maturity, New England, as the oldest region, is one step ahead of the rest of the country. In the present "mature" stage of New England's development there are more jobs in trade, service, professions, etc., than in manufacturing. This kind of situation does not call for a particularly large volume of construction since there is relatively little need for new industrial facilities or additional housing to take care of an influx of new workers. On the other hand, the high income and high standard of living that goes with a mature economy tend to create a sustained market.

MIDDLE ATLANTIC STATES

Summary

Construction seems likely to be active but to make up a smaller part of the national total than prior to the war. Diversification of industry and some degree of concentration of wealth mean above-average stability.

Background

The Middle Atlantic States—New York, Pennsylvania, and New Jersey—have the highest concentration of wealth and population of any section of the country. These three States have more people and more jobs than any other regional group, with the East North Central States as the only close competitor. The bulk of the population lives in the region's 19 metropolitan districts. The New York City-Northeastern New Jersey, Philadelphia-Camden, and Pittsburgh areas account for 60 percent of the population, and the 19 metropolitan districts combined account for over 75 percent.

The Middle Atlantic division, as a center of manufacturing, commerce, and finance, has long set the pace for the entire Nation. However, like New England, the division is "old,"

and for some years its top position in the Nation's economic set-up has been less outstanding than formerly. Around the beginning of this century its manufacturing activity began to shrink in proportion to the Nation's total. A shift in emphasis to commerce and finance counteracted manufacturing losses to some extent, and the division still holds the largest share of the Nation's jobs. But from 1930 on, growth in the remainder of the Nation has exceeded that in this region on all counts —total employment, income, and population.

The Middle Atlantic division specializes in commercial and financial services. This is particularly true of New York City—the Nation's number one management and financial center. Many of the home offices of national corporations are found in New York, as well as large banks, insurance companies, advertising agencies, commodity and security exchanges, etc. Other than that, New York is the most important distribution and importing center in the country. New York City is also a design and management center for construction, with many architectural and engineering offices, and with the main offices of most of the very large contracting firms which operate on a Nationwide or international scale.

The principal manufacturing industries in the Middle Atlantic division are apparel, paper and printing, metals, chemicals, machinery, textiles, food, and tobacco. Although manufacturing in most localities is diversified, consumer goods are the most prevalent. New York, Philadelphia and Rochester produce around one half of the Nation's clothing, and the first two cities handle a good part of the printing and publishing business. Philadelphia, Wilkes-Barre, and Paterson are important textile producers. In the heavy goods line, there is Buffalo-Niagara Falls, the leading industrial area in upstate New York, and Pittsburgh, the world's leading production center for iron and steel.

Important activities in other fields are shipbuilding (in the Philadelphia-Camden and Newark areas) and coal mining (anthracite in the Scranton-Wilkes-Barre area, extending from Scranton south to Pottsville, Pa.; soft coal in western Pennsylvania in the counties adjacent to Pittsburgh), and petroleum refining. There are many additional types of manufacturing not mentioned separately, some of them employing more workers than the major industries in some of the other regions.

Postwar Construction

The 1947 volume of new construction in the Middle Atlantic States amounted to a little over 2.2 billion dollars, with New York State accounting for about 45 percent of the total. By type of construction, the largest component in the construction bill was the 722 million dollars worth of private (nonfarm) residential building. About 581 million dollars was spent for private nonresidential building, and close to 583 million dollars for publicly financed construction.

The division's construction activity in 1947 was only 65 percent above prewar, compared with a gain of 122 percent for the United States as a whole. As the division stands now, it has a 15.8 percent share in the Nation's construction, in comparison with 21.2 percent in 1939. Construction has been particularly slack in New York, where the 1947 volume was only 20 percent above prewar. The State's share of total construction fell from almost 13 percent in 1939 to 7 percent in 1947. The other two States had larger portions of the national total than in 1939.

A decrease in the Middle Atlantic's share of the Nation's construction was in evidence before the war, as a part of the general trend affecting all phases of the division's economy. But the boost given to industrial development in the South and West during the war exaggerated this trend. True, there was considerable wartime industrial expansion in each of the Middle Atlantic States, but most of the war activity was in or around established industrial centers. Consequently, existing industrial plants and local labor took care of additional requirements to a greater degree than in most other parts of the country. The net result was that the need for additional homes and additional industrial facilities was proportionately lower here than in sections where industrial development was accelerated by the war.

The Future

New industrial areas elsewhere are holding on to their recent gains, and it looks as though

Table 12.—*Estimated expenditures for new construction, 1947 and 1939*

Region and State	Total new construction		Private residential building		Private nonresidential building		Public construction	
	1947	1939	1947	1939	1947	1939	1947	1939
	[Millions of dollars]							
Middle Atlantic	2205.0	1338.9	721.9	519.0	580.5	183.0	582.5	509.3
New York	978.1	813.9	292.2	320.1	222.4	113.0	336.4	318.5
New Jersey	457.9	184.8	191.0	70.2	159.5	25.4	65.8	70.7
Pennsylvania	769.0	340.2	238.7	128.7	198.6	44.6	180.3	120.1
	[Percent of U.S. Total]							
Middle Atlantic	15.8	21.2	13.7	24.5	18.5	23.3	18.9	20.3
New York	7.0	12.9	5.6	15.1	7.1	14.4	10.9	12.7
New Jersey	3.3	2.9	3.6	3.3	5.1	3.2	2.1	2.8
Pennsylvania	5.5	5.4	4.5	6.1	6.3	5.7	5.8	4.8

Source: U. S. Department of Commerce, Construction and Construction Materials, Statistical Supplement, June 1948, tables I, II, and III.

a considerable part of the wartime shift in the distribution of construction will be permanent. Beyond that, the prewar situation of slower growth than in less urban and less industrialized parts of the country seems to be continuing. Population is increasing less rapidly than for the country as a whole, in large measure, at least, because so much of the population is urban.

In spite of the gains made by other sections during the war, the Middle Atlantic is still one of the largest construction markets. It ranks third among the regions in the volume of construction. Two of the Middle Atlantic States—New York and Pennsylvania—are near the top of the list, in third and fourth positions, respectively.

So far as the immediate outlook is concerned, construction activity in the Middle Atlantic States should continue at its present level for at least the next several years. What happens after that, of course, depends largely upon economic conditions in general. But the Middle Atlantic States should be able to take economic ups and downs with a little better balance than most of the other divisions. For one thing, the division's high standard of living makes for a comparatively steady market. Then, too, each of the Middle Atlantic States and most of the important localities within these States[5] have a large variety of industries. Consequently, losses in one industry are likely to be offset by gains in another.

Of a more direct bearing upon the outlook for construction in the division, are the unusually large expenditures for publicly financed construction. The Middle Atlantic States, influenced mainly by New York State and New York City, have a larger volume of public nonresidential buildings (educational and recreational facilities, hospitals, etc.) than any other division. Construction expenditures of public utility companies are also considerably above average, since this type of construction is most complicated and expensive in thickly populated areas.

[5] Two notable exceptions are Pittsburgh, with its emphasis on steel, and the anthracite coal area around Scranton.

GREAT LAKES STATES (EAST NORTH CENTRAL STATES)

Summary

Construction prospects are good—better than those of the more mature parts of the older regions and more stable than those of currently growing regions in the South and West. Within the region, stability will be greatest in diversified areas and poorest in the specialized durable goods areas.

Background

The Great Lakes States— Illinois, Indiana, Michigan, Ohio, and Wisconsin—constitute one of the most highly industrialized regions in the country. The hub of the Nation's heavy goods industry, the five-State area has more manufacturing jobs than any other region and follows closely behind the Middle Atlantic States in total employment. However, intraregional differences in economic make-up are marked. Wisconsin and Indiana, for instance, are big farm producers, whereas Michigan and Ohio are strong on heavy goods manufacturing. In Illinois, industry is most diversified, with extensive financing and wholesaling activity as well as manufacturing and farming.

But intraregional differences are best illustrated by crossing State boundaries. There is notable concentration of the region's population and industry in two extended areas along the lakes. One of these runs along the lower end of Lake Michigan from Milwaukee, south to Chicago, and then eastward in northern Indiana. The other is a part of a semi-continuous, concentrated area, which begins at Detroit on Lake St. Clair, continues south to Toledo on Lake Erie, eastward along the lake beyond Cleveland, and then extends past the regional boundary to Erie and Buffalo-Niagara Falls in the Middle Atlantic States. Smaller intervening cities in this strip include Monroe, Sandusky, Lorain, and Ashtabula. There are other important centers, such as Indianapolis, Columbus, Dayton, and Cincinnati, and many smaller industrial centers. While the remainder of the region is predominantly agricultural, in Ohio particularly and to a lesser degree elsewhere, relatively small industrial cities are very numerous.

The principal manufacturing industries in the region are motor vehicles and parts, iron and steel, machinery, food processing, paper and printing, chemicals, and rubber. Chicago —the leading city—is an important transportation and trade center. Moreover, the Chicago area—including nearby industrial cities—is a big producer of iron and steel, machinery, processed foods, apparel, and various other products. Detroit is the automotive capital of the world. It is the focus of a motor vehicle area including a number of other cities—Toledo, Flint, Pontiac, Lansing, Jackson, Saginaw, and many smaller places. The Cleveland metropolitan area is one of the country's biggest steel producers. In addition to the three largest, there are 26 other metropolitan districts in the Great Lakes region. Although the accent on heavy goods is pronounced, industry is fairly well diversified in most of these localities.

Postwar Construction

In the postwar year 1947, total new construction in the Great Lakes States amounted to a little more than 2.7 billion dollars, or 19.4 percent of the national construction bill. The Great Lakes share of the Nation's construction was the highest of any regional group. The leading State in the dollar volume of construction was Illinois ($753,000,000), with Ohio running a close second. The third State, Michigan, had 639 million dollars worth of construction, while Indiana and Wisconsin each had less than half that much.

Private nonfarm building was valued at 1,726 million dollars, or close to 65 percent of total new construction in the region. Private residential building accounted for over 1,055 million dollars, and nonresidential building for more than 670 million dollars. Expenditures for public construction of all kinds totaled about 480 million dollars.

As the Great Lakes region stands now, it is in about the same position with respect to total construction as it was before the war. Unlike New England and the Middle Atlantic States, the Great Lakes States were only slightly affected by the wartime shift in con-

Table 13.—*Estimated expenditures for new construction, 1947 and 1939*

Region and State	Total new construction		Private residential building		Private nonresidential building		Public construction	
	1947	1939	1947	1939	1947	1939	1947	1939
	[Millions of dollars]							
Great Lakes (East North Central)	2706.4	1231.8	1055.2	424.8	670.4	160.7	480.2	429.1
Ohio	727.9	330.0	279.9	125.4	170.3	42.1	120.5	116.1
Indiana	309.6	143.6	102.3	38.7	85.4	19.8	49.9	53.2
Illinois	753.3	354.0	272.4	102.3	197.7	48.3	149.4	129.2
Michigan	639.3	270.1	301.3	118.0	144.5	35.8	110.3	78.2
Wisconsin	276.3	134.1	99.3	40.4	72.5	14.7	50.1	52.4
	[Percent of U. S. Total]							
Great Lakes (East North Central)	19.4	19.5	20.1	20.1	21.4	20.5	15.6	17.1
Ohio	5.2	5.2	5.3	5.9	5.4	5.4	3.9	4.6
Indiana	2.2	2.3	1.9	1.8	2.7	2.5	1.6	2.1
Illinois	5.4	5.6	5.2	4.8	6.3	6.2	4.8	5.2
Michigan	4.6	4.3	5.7	5.6	4.6	4.6	3.6	3.1
Wisconsin	2.0	2.1	1.9	1.9	2.3	1.9	1.6	2.1

Source: U. S. Department of Commerce, Construction and Construction Materials, Statistical Supplement, June 1948, tables I, II, and III.

struction activity to the South and West. Although the Great Lakes States had very little in the way of military and naval construction, the region exceeded all others in the number and value of war plants installed. The increasing population and urbanization, which went along with wartime industrial expansion, created a greater demand for construction in this region than for the country as a whole. Between 1939 and 1946, the region's share of the Nation's construction increased from 19.5 percent to 21 percent. However, a drop in nonresidential private construction in 1947 resulted in a decline in the region's relative position, bringing it back to its prewar status.

The Future

The short-run outlook for construction in the Great Lakes States is most favorable. Heavy goods industry—the Great Lakes specialty—fluctuates sharply with ups and downs in the business cycle, and, consequently, the region receives a comparatively big boost in periods of prosperity. In 1947, the dollar volume of construction in the region was only 120 percent above prewar, just about equal to the national increase. But the 1947 construction volume would have been much higher except for certain postwar difficulties that affected this region more than others.

Its relative position seems likely to improve, especially in the private nonresidential construction field. In any event construction activity will be maintained at a high level in proportion to that of the entire country for at least the next several years.

Of course, another depression, like that of the thirties, would be particularly bad for the construction activity in the Great Lakes States. But, barring this eventuality, the long-run outlook is fairly good. In fact, this geographic division should retain its position of leadership in the Nation's construction activity for some years to come. While the region is not exactly a growing one, there is as yet no real indication of a decline in proportion to the rest of the country, such as experienced by the Middle Atlantic and New England States. Fractional relative losses in key manufacturing lines occurred during the war, but they were too small to be considered a sympton of weakness.

Within the region, conditions are more stable in some sections than in others. In Illinois (especially around Chicago), where industry is varied and slow-moving property income high, the construction market is fairly steady. On the other hand, in Ohio and Michigan, with their heavy or durable goods centers, such as Cleveland and Detroit, construction is more immediately susceptible to general economic activity.

WEST NORTH CENTRAL STATES

Summary

Little change in construction activity seems likely from that of recent prosperous periods. This region, even to some degree its leading metropolitan centers, is much more dependent on farm prosperity than is the country as a whole.

Background

The West North Central States—Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas—are the biggest farm producers in the country. Their total farm income exceeds that of any other region; and they lead in the production of various farm commodities, including livestock, poultry and poultry products, corn, wheat, oats, barley, and rye.

Throughout the entire region, farming is the principal way of life. There are more people engaged in agriculture than in any other activity. All the States are more agricultural and less industrial than the national average. About 31 percent of the 1940 population lived in metropolitan districts.[6] However, the individual States vary in the extent to which they conform to the over-all regional pattern. Population and industry tend to be concentrated in the eastern part of the region. The Dakotas do not have a single metropolitan district, and in both Kansas and Nebraska the metropolitan districts are located near the eastern border. The three easternmost States—Missouri, Minnesota, and Iowa—are fairly well industrialized in comparison with the rest of the region. Combined, they account for about 80 percent of the region's factory jobs.

Manufacturing is closely allied with agriculture. Food processing was by far the biggest prewar industry, and, since the beginning of the war, industrial growth has followed the prewar pattern. Numerous small poultry-dressing plants, milk evaporation and dehydration plants, creameries, and canneries have been established since the end of the war. There was no real war production boom in the region. Except for ordnance and explosive plants scattered here and there, the bulk of the war activity was confined to a few areas such as Wichita and Kansas City (aircraft) and St. Louis and Minneapolis-St. Paul (aircraft, iron and steel).

The majority of the cities in the region are trading centers for surrounding farm country and distribution centers for larger areas. In most places, any manufacturing is largely food processing. But this is not true of the three largest metropolitan districts—St. Louis, Minneapolis-St. Paul, and Kansas City. In a number of smaller cities there is active manufacturing outside of the food industry but much less than is commonly found in cities of similar size in the northeastern section of the country.

Postwar Construction

In 1947, new construction in the West North Central States was valued at a little over 1.2 billion dollars. Missouri, with a construction volume of approximately 278 million dollars, was the leading State, while Minnesota and Iowa followed closely in second and third positions, respectively. Construction expenditures were smaller in the more rural States to the west. Kansas and Nebraska had 207 million and 122 million dollars worth of construction, respectively. The two Dakotas combined had not much over 120 million dollars worth.

Almost half of the total regional construction bill consisted of nonfarm private building. About 326 million dollars of this went for homes

[6] Within the region are 12 complete metropolitan districts and the Iowa portion of the Davenport-Rock Island-Moline district.

and other residential building, and 235 million dollars for nonresidential buildings (factories, stores, offices, churches, etc.). Highway and sewer construction, hospital and educational buildings, and other publicly financed construction made up about one-fourth of the total. Farm and public utility construction accounted for the remainder.

Table 14.—*Estimated expenditures for new construction, 1947 and 1939*

Region and State	Total new construction		Private residential building		Private nonresidential building		Public construction	
	1947	1939	1947	1939	1947	1939	1947	1939
	[Millions of dollars]							
West North Central	1245.6	543.2	326.1	125.6	235.0	52.9	298.4	229.3
Minnesota	263.3	134.4	104.2	38.7	41.3	12.0	56.2	58.0
Iowa	254.1	112.7	50.3	23.7	67.5	12.7	49.2	42.3
Missouri	278.0	133.3	73.9	37.0	72.3	15.7	53.5	55.1
North Dakota	56.8	18.7	9.3	2.3	5.6	1.2	18.3	9.3
South Dakota	64.2	22.7	12.2	2.5	4.0	1.3	25.2	13.7
Nebraska	122.3	55.8	31.0	10.4	15.2	3.9	37.7	25.6
Kansas	206.9	65.6	45.2	11.0	29.1	6.1	58.3	25.3
	[Percent of U. S. total]							
West North Central	8.9	8.6	6.2	5.9	7.5	6.7	9.6	9.1
Minnesota	1.9	2.1	2.0	1.8	1.3	1.5	1.8	2.3
Iowa	1.8	1.8	1.0	1.1	2.2	1.6	1.6	1.7
Missouri	2.0	2.1	1.4	1.8	2.3	2.0	1.7	2.2
North Dakota	.4	.3	.2	.1	.2	.2	.6	.4
South Dakota	.5	.4	.2	.1	.1	.2	.8	.5
Nebraska	.9	.9	.6	.5	.5	.5	1.2	1.0
Kansas	1.5	1.0	.9	.5	.9	.8	1.9	1.0

Source: U. S. Department of Commerce, Construction and Construction Materials, Statistical Supplement, June 1948, tables I, II, and III.

Since the beginning of the war, the West North Central region has gained but slightly with respect to construction. The 1947 volume of new construction amounted to 8.9 percent of the national total as compared with 8.6 in 1939. Three of the States (North Dokata, South Dakota, and Nebraska), suffered population losses from 1940 to 1948—12.8, 3.6, and 1.3 percent, respectively. Gains made in Kansas and in the three easternmost States brought the regional average up to an increase of 3.2 percent, but there was not a single State where the rate of population increase was as high as the national average.

Although population in the region is still increasing at a slower rate than in the Nation as a whole, census estimates for July 1948 show that significant gains have been made in the postwar period. Up to the end of the war, the West North Central States had been losing population through migration for over a decade. During the drought of the middle 1930's, thousands of farm workers migrated from the dust-bowl States to California and other Pacific States. After the war began, there was further migration from West North Central farms to war production centers in other parts of the country, but with the coming of peace this trend was reversed. Men began to return to the farm as they were released from military service or as their war jobs came to an end. High farm prices and the end of the drought were encouraging factors.

In the interval from 1939 to 1947, any gain or loss among the various States in their share of total construction activity was small, except for Kansas, where there was an increase from 1.0 to 1.5 percent. Here, commercial and manu-

facturing activities, together with a postwar rise in food processing, created sufficient employment opportunities to draw some of the State's farm population to its cities. A few big aircraft factories in Wichita and Kansas City were converted to the manufacture of light metal products and other consumer goods. Although peacetime employment in these plants is much below the wartime level, it is still considerably in excess of prewar. Kansas has also benefited from its central geographic location which makes its airports ideal transfer points for airline traffic. Its airports are used as operating offices and maintenance centers for military and commercial aviation.

The Future

Construction activity in the West North Central States should continue at the present high level for at least the next several years. It is not likely, however, that any new peak will be reached. There is nothing to indicate that the outlook for construction in the region is any better or any worse than the outlook for construction in the Nation as a whole. In fact, in the prewar to postwar shakeup in the distribution of construction, the position of the West North Central States changed but little. The region's dollar volume of construction rose 129 percent from 1939 to 1947 as compared with a national increase of 122 percent.

High farm prices have done the most to bring the region back to its prewar relative position in the construction industry. Other than the boost it has given to the over-all regional economy, high farm income has made it possible for the huge farm construction backlog which accumulated from the early thirties to the end of the war to be translated into active demand. Full employment, high wages, exports under the Marshall Plan, price support for the principal farm products, all point toward a continuation of fairly high farm prices for some time to come. The long-term outlook for agricultural products is unpredictable, but certainly any major reduction in farm purchasing power would be a severe blow to construction activity in the region.

In any event, it is not likely that the West North Central States will increase their share of the Nation's construction. Since around 1890, the rate of population growth has lagged behind that for the Nation as a whole. Population grew at a rapid rate during the early years of settlement, but, during the past 50 years or thereabouts, the region has remained heavily rural while other areas have become industrialized. It is also likely that farm mechanization, already greater here than in any other part of the country, will continue to reduce farm labor requirements, and that there will be some further migration of surplus farm population to other regions. This will mean a higher per capita income for those remaining on the farm, however, and hence will tend to encourage an active farm construction program of new buildings, modernization, and improvement.

Construction will tend to be concentrated in the more populous parts of the region—namely, Missouri, Minnesota, and Iowa, and eastern Kansas and Nebraska. Locally, construction will be most active in the largest and most highly industrialized areas, such as St. Louis, Minneapolis-St. Paul, and Kansas City.

SOUTH ATLANTIC STATES

Summary

For the region as a whole, the prospects for increased construction activity are good. Exceptions are Maryland and Delaware, where future population growth is likely to be relatively slow. Sound growth is likely in those States where expanding industry has not yet exceeded agriculture in employment—Virginia, West Virginia, the Carolinas, and Georgia. In Florida, active construction is likely during periods of prosperity. For the District of Columbia, long-range prospects are good, with above-average stability in any depression.

Background

The South Atlantic is a loosely knit region, running along the Atlantic seaboard from Delaware and Maryland all the way down to

Florida, and stretching inland to include West Virginia and the District of Columbia. Intraregional differences are very pronounced, especially between the northern and southern parts of the region. Delaware and Maryland have much in common with the Middle Atlantic group of States (New York, New Jersey, and Pennsylvania). Manufacturing is the major activity; population density is high in comparison with the rest of the region. A large part of West Virginia, in the northwestern section of the region, is sparsely populated, mountainous territory. The leading industry is mining, manufacturing is second, and agriculture is third. Government and trade and service employment provide the bulk of the jobs in the District of Columbia.

With the exception of Florida, the States south of the District of Columbia are fairly homogenous. North Carolina, South Carolina, Georgia, and Virginia are a part of what is commonly known as the southeast. Although industrial development in recent years has been rapid, this group of States is still primarily agricultural. Cotton and tobacco are the agricultural specialties. The trend is toward diversification, but much of the farmland in this area is still devoted to these crops. In manufacturing, too, the emphasis is on a few types of products, such as textiles, lumber, furniture, and foods. Paper making has been an up and coming industry ever since the thirties when processes were developed for making newsprint and other grades of white paper from southern pine. During the war there was large-scale expansion in shipbuilding, aircraft, and ordnance, but there was little permanent gain in these lines. Advances were made, however, in chemical manufacture — particularly in chemicals made from wood pulp and cotton linters. Moreover, textile, wood, food, and other prewar industries employ many more people now than before the war.

The last State—Florida—has a character all of its own. It is the least industrialized of all the South Atlantic States, with 12 percent of its working population in manufacturing jobs in 1940. Florida is an important agricultural State. Its subtropical climate makes possible an almost year-round growing season. Fruits and vegetables, the principal crops, are shipped north in large quantities. But the State's large resort business creates more jobs than any other activity. In 1940, for instance, there were as many people in personal service jobs as in agriculture. Florida's popularity as a resort area has made it one of the fastest-growing States in the Union.

In the States south of the District of Columbia, much of the manufacturing activity is scattered in small towns and cities. There are numerous textile towns, furniture towns, etc., with the local economy centered on one industrial establishment. While this situation is rather precarious for the town, it is consistent with industrialization and its effect on construction. Larger cities such as Atlanta, Richmond, Charleston, and Jacksonville have a variety of manufacturing establishments, but they are primarily trading and distribution centers. Shipbuilding, ship repair, and port activities are important in the Norfolk-Portsmouth-Newport News area and in Charleston (S. C.), Savannah, Jacksonville, and other harbor cities.

Unlike the situation in the States to the south, manufacturing in Delaware and Maryland is concentrated in two large industrial centers—Wilmington and Baltimore.

Wilmington is best known as the location of administrative offices and research units of several large chemical firms. Actual production of chemicals is minor, but research and administrative activities call for a large number of professional men, technicians, and white-collar workers. Other leading industries in and near Wilmington are leather tanning, textiles, food products, iron and steel products, and shipbuilding. There was wartime expansion in shipbuilding, ordnance, metal and machinery, and other industries. Despite large-scale layoffs after VJ-day, manufacturing employment is still well above prewar.

Baltimore has a well-balanced economy, with industry, commerce and finance all playing important roles. Among the foremost manufacturing industries are iron and steel, shipbuilding, chemicals, machinery, clothing, food processing, and aircraft. Wartime expansion was very great, but for the most part it was confined to aircraft and shipbuilding. Although manufacturing employment is well in excess of prewar, sharp cuts in aircraft and shipbuilding

have brought it down to a level considerably below the wartime peak.

In West Virginia, manufacturing is concentrated along the Ohio and Kanawha Rivers, in such indutrial cities as Wheeling, Huntington, Parkersburg, and Charleston. Leading branches of manufacture are iron and steel; stone, clay, and glass; and chemicals and allied products. Because of its vast power resources—coal, natural gas, water power—and its excellent river transportation, West Virginia has a great potential for industrial development. The war brought about a large expansion of manufacturing facilities, particularly in chemicals. Plant additions were also made for the production of steel, synthetic rubber, explosives, and various other goods. When the war ended, manufacturing employment declined sharply, but at the present time all branches of manufacturing are above prewar, with chemicals taking the lead.

Postwar Construction

In 1947, total new construction activity in the South Atlantic States amounted to over 1.8 billion dollars, or 13.3 percent of the national bill. By far the most active construction State was Florida, with over 457 million dollars worth of new construction. Among the other States in the region, the dollar volume ranged from slightly over 26 million dollars in Delaware to nearly 293 million dollars in Virginia. The District of Columbia had approximately 78 million dollars worth of new construction, not including adjoining suburban areas in Maryland and Virginia.

Privately financed nonfarm building made up over 60 percent of the regional bill, residential building alone nearly 43 percent. Public construction—including public nonresidential buildings, publicly financed housing, military and naval installations, highways, conservation and development projects, etc.—accounted for only 22 percent of total new construction.

The dollar volume of total new construction in the region was 126 percent higher in 1947 than in 1939—compared with 122 percent for the Nation as a whole. Within the region, Florida was the only State to make any significant gain. Florida showed a 23 percent increase in civilian population from 1940 to 1948. This, in conjunction with a postwar boom in the tourist business, acted as a stimulus to building activity, and Florida's share of the Nation's construction rose from 2.1 percent in 1939 to over 3.3 percent in 1947.

Four other States—Georgia, North Carolina, South Carolina, and West Virginia—made small increases in their portions of national construction activity. Although these States lost population to other areas during the war,[7] a farm-to-city movement increased their potential for residential building, and postwar investment in new industrial facilities further encouraged urbanization.

No gains were made in the rest of the region. The District of Columbia's part of the Nation's construction fell from 1.3 percent in 1939 to 0.6 percent in 1947, Virginia's from 2.5 to 2.1 percent, and Delaware's from 0.3 to 0.2 percent; Maryland's part was unchanged at 1.6 percent.

The District of Columbia is not comparable to any of the States because geographically it is identical with the city of Washington, exclusive of all surrounding suburbs. From the early thirties to the end of the war, population growth for the Washington metropolitan area greatly exceeded that for the country as a whole, and this growth was most rapid in the Virginia and Maryland suburbs outside of the central city. During most of this period, construction (mainly Government buildings and private housing) was much above the national rate. This was reflected in the rate for the District, with marked influence on the construction rate for Virginia and less influence on the rate for Maryland. Contraction of Federal employment following the end of the war and a very low level of Federal construction in the Washington area depressed construction in the District of Columbia while it was being stimulated elsewhere. They likewise depressed construction in the adjoining parts of Virginia sufficiently for a downward influence on the State rate and had a similar but smaller effect on Maryland. More recently, private construction in the Washington area has expanded.

Delaware drew a large number of migrants during the war, but by 1948 civilian popula-

[7] Civilian population gain from 1940-48 was 0.2 percent in Georgia, 0.7 percent in West Virginia, 3.9 percent in South Carolina, and 3.1 percent in North Carolina, as compared with a national increase of 10.6 percent, indicating out-migration.

Table 15.—*Estimated expenditures for new construction, 1947 and 1939*

Region and State	Total new construction		Private residential building		Private nonresidential building		Public construction	
	1947	1939	1947	1939	1947	1939	1947	1939
	[Millions of dollars]							
South Atlantic	1,853.2	818.9	788.7	303.9	369.1	108.5	404.2	313.3
Delaware	26.0	18.1	7.3	7.0	9.0	3.7	4.6	5.5
Maryland	225.1	102.7	84.8	39.1	51.0	13.4	62.0	41.3
District of Columbia	78.1	84.2	28.1	34.0	18.4	20.9	18.1	24.8
Virginia	292.7	155.3	129.3	53.9	47.5	16.0	65.3	68.4
West Virginia	148.9	63.1	38.6	18.8	31.0	8.4	32.8	22.3
North Carolina	267.7	114.5	109.2	35.9	61.0	15.7	61.3	46.8
South Carolina	126.8	51.4	33.2	16.5	33.1	6.9	42.8	21.1
Georgia	230.8	97.3	78.6	29.2	53.6	12.5	49.1	40.4
Florida	457.1	132.3	279.6	69.5	64.5	11.0	68.2	42.7
	[Percent of U. S. total]							
South Atlantic	13.3	13.0	15.0	14.4	11.8	13.8	13.1	12.5
Delaware	.2	.3	.1	.3	.3	.5	.1	.2
Maryland	1.6	1.6	1.6	1.8	1.6	1.7	2.0	1.7
District of Columbia	.6	1.3	.5	1.6	.6	2.7	.6	1.0
Virginia	2.1	2.5	2.5	2.5	1.5	2.0	2.1	2.7
West Virginia	1.1	1.0	.7	.9	1.0	1.1	1.1	.9
North Carolina	1.9	1.8	2.1	1.7	1.9	2.0	2.0	1.9
South Carolina	.9	.8	.6	.8	1.1	.9	1.4	.8
Georgia	1.7	1.5	1.5	1.4	1.7	1.6	1.6	1.6
Florida	3.3	2.1	5.3	3.3	2.1	1.4	2.2	1.7

Source: U. S. Department of Commerce, Construction and Construction Materials, Statistical Supplement, June 1948, tables I, II, and III.

tion was only 11.6 percent greater than 1940. Practically the entire wartime gain was due to shipbuilding activity in and around Wilmington. After VJ-day, shipbuilding employment fell rapidly, and war migrants began to leave the State.

The Future

Construction activity in the South Atlantic States should continue at a high level for at least the next several years, with probably some increase in the physical volume for the region as a whole. As long as prosperity continues, Florida will maintain its position as the region's most active construction State. Good business conditions have been a boon to the State's tourist trade, and this factor alone is enough to keep the construction volume high. Miami, the center of the largest winter resort area, is one of the most active building areas in the country. In 1947, this city ranked sixth in the value of residential building permits issued and eighth in the value of permits for all types of building construction, although it was forty-eighth in rank, according to 1940 population. If a depression should come along, construction activity in Florida—particularly in resort areas—would be more severely affected than almost anywhere else in the country. However, Florida should not be as hard hit by a future depression as it was by the last one. The current building boom is based on established popularity as a resort area, whereas the boom of the twenties was dependent primarily on speculative land values which started to collapse a few years before the beginning of the general depression.

The other States south of the District of Columbia should add to their share of the Nation's construction. The urbanization that followed industrial expansion in these pre-

dominantly rural States has given rise to a considerable demand for houses and other buildings to accommodate the increased urban population. Gains made in per capita income since before the war will boost construction indirectly through their effect on the over-all economy.

West Virginia is another State that has raised its potential for construction activity by industrialization and urbanization. However, in Maryland and Delaware, where manufacturing is concentrated in established manufacturing centers, industrial expansion did not have the same stimulating effect upon building activity. It is unlikely that either of these States will improve its relative standing to any marked extent.

Construction activity in and near the District of Columbia depends on Government employment and on the Federal construction program. The long-range outlook is probably for a fairly high rate of activity. In the event of a depression, the area would be in a comparatively favorable position because of steady Government payrolls, and construction would probably be stimulated by replacement of temporary and obsolete Federal buildings.

Over the long run, the outlook for increased construction activity is very favorable in those States which are developing industrially, although still primarily dependent upon agriculture or extractive industries. Georgia, North Carolina, South Carolina, Virginia, and West Virginia fall into this category. All have made big industrial gains in recent years, and, in the years to come, they will probably continue to add to the number and variety of their manufacturing establishments. With farm mechanization becoming more widespread all the time, cities will continue to gain population from surrounding farm areas. Also a more efficient and diversified agricultural system will lead to higher per capita income for a smaller farm population. All this will have a stimulating effect on construction activity, more than compensating for any out-migration that might take place.

Florida has been growing at a much faster rate than the national average for every decade since 1830. It is likely that the State will continue to draw migrants from other areas, even though population gains may not be as large as in the past. Consequently, except for setbacks caused by fluctuations in general economic activity, construction should be more active in Florida than in the country as a whole.

Economically, Delaware and Maryland have reached a stage of comparative maturity. Since neither of these States is likely to experience any relative gain in population, income, or employment, it seems likely that the future will mean a smaller share of total construction activity.

The outlook in the District of Columbia is for a good, steady volume of construction, with some increase if governmental services expand.

EAST SOUTH CENTRAL STATES

Summary

This region, now developing toward economic maturity, should attain a larger share of the national construction total. Industrial growth and urbanization mean increased construction potentialities in Tennessee and Alabama, and to a smaller degree in Kentucky.

Background

The East South Central States (Alabama, Tennessee, Kentucky, and Mississippi) are all primarily rural, farm States. Cotton is the big money crop throughout the region, except in Kentucky where tobacco is the agricultural specialty. More and more, however, the East South Central States are getting away from the one-crop system. In Kentucky, corn, hay, wheat, and other grains are grown in abundance, and dairy, poultry, and truck farming are on the increase. Tennessee still grows a lot of cotton, but considerable headway has been made toward all-around farming. In Alabama, too, for a number of years cotton growing has been less dominant. Corn has become an important crop, as have hay, oats, peanuts and fruits of various kinds. The fourth State, Mississippi, has kept to the one-crop system

more tenaciously than the others and is still predominantly a cotton-growing State.

Despite the fact that the East South Central States remain primarily agricultural, they have made rapid industrial development in recent years. Cheap hydroelectric power and the proximity to raw materials, such as lumber and cotton, have been the principal incentives for the location of new industries in the region. Cheap river transportation, expanding local markets, and the prospect of recruiting an adequate labor supply from the surplus farm population, are other inducements. Naturally, the greatest gains are being made in industries which need the region's cheap power and its raw materials. Textile, lumber, and food products industries are already firmly established. More recent gains have been made in manufacture based on wood — paper, wood pulp, building board, and rayon — for which the quick-growing southern timber can now be used. The chemical industry branched out during the war and continued to expand in the postwar period.

Tennessee and Alabama have taken the lead in industrial development and account for about 70 percent of the region's manufacturing jobs. Both States were given an especially big boost by the war. Alabama had the greatest expansion of war industry facilities, yet Tennessee came out of the war and reconversion periods a little better off in terms of manufacturing employment. Ammunition manufacturing and shipbuilding constituted a good part of war production in Alabama and, of course, both of these activities dropped after the end of active hostilities. Recent growth in Tennessee was more along peacetime lines. New industrial projects for chemicals, rayon, and paper have been initiated in Tennessee since the end of the war.

Among the cities in the region, the largest, in order of size, are Louisville, Kentucky; Birmingham, Alabama; Memphis and Nashville, Tennessee. Birmingham, an iron and steel center, is the most highly industrialized city in the group, with the bulk of the labor force engaged in manufacturing. The other cities are primarily trading centers and agricultural markets. Each has a variety of manufacturing industries, but manufacturing employment is secondary to trade and service.[8]

Postwar Construction

Expenditures for new construction in the East South Central States amounted to a little over 717 million dollars in 1947, or slightly more than 5 percent of the national total. Tennessee had approximately 232 million dollars worth, Alabama 187 million dollars, Kentucky 178 million dollars, and Mississippi 120 million dollars. Private building construction (excluding farm and utility construction) accounted for about half of the regional bill. Over 191 million dollars was spent for residential building and 153 million dollars for factories, stores, offices, and other nonresidential building. Publicly financed construction (public buildings, highways, military and naval construction, etc.), plus farm and public utility construction, made up the other half of the regional total.

During the period from 1939 to 1947, the region's share of total construction activity fell off to some degree. The regional total was 116 percent above prewar in 1947, compared with a national increase of 122 percent. Substantial gains in private building were offset by a drop in the region's relative share of public construction, bringing about an over-all decrease. Mississippi had a particularly low volume of public construction in comparison with prewar, and it was this State that experienced the greatest relative loss in total construction activity. Tennessee fared better than any of the other States. Public construction was more active there. More important is the fact that private nonresidential building was several times that for 1939, although below the level of 1946 when industrial building in the State was greatly expanded by a few unusually large projects.

The construction picture for the region does not follow any consistent pattern. Kentucky and Mississippi lost population between 1940 and 1948, and both of these States showed a decrease in their relative shares of construction activity. Because of a postwar decline in manufacturing activity—followed by a population exodus—Alabama also had fewer resi-

[8] *Source*: USES, Labor Market Information, Area Series.

Table 16.—*Estimated expenditures for new construction, 1947 and 1939*

Region and State	Total new construction		Private residential building		Private nonresidential building		Public construction	
	1947	1939	1947	1939	1947	1939	1947	1939
	[Millions of dollars]							
East South Central	717.3	332.0	191.1	66.0	153.2	30.2	217.4	187.5
Kentucky	177.7	89.3	39.7	19.3	35.7	9.7	54.6	45.0
Tennessee	232.2	90.5	59.2	20.9	53.9	9.3	74.7	48.5
Alabama	186.9	81.0	60.6	16.3	46.4	8.9	49.3	45.4
Mississippi	120.5	71.2	31.6	9.5	17.2	2.3	38.8	48.6
	[Percent of U. S. total]							
East South Central	5.1	5.3	3.6	3.1	4.9	3.8	7.1	7.5
Kentucky	1.3	1.4	.8	.9	1.1	1.2	1.8	1.8
Tennessee	1.7	1.4	1.1	1.0	1.7	1.2	2.4	1.9
Alabama	1.3	1.3	1.2	.8	1.5	1.1	1.6	1.8
Mississippi	.9	1.1	.6	.6	.6	.3	1.3	1.9

Source: U. S. Department of Commerce, Construction and Construction Materials, Statistical Supplement, June 1948, tables I, II, and III.

dents in 1947 than before the war. However, out-migration seems to have been checked once the reconversion period was over. Census estimates indicate that in July 1948, population in Alabama was a fraction of a percent above 1940. The State's share of construction activity in 1947 was approximately equal to prewar.

Tennessee, which acquired new industries after the war, showed significant population gains in 1947 and 1948 over 1940, although the increase was at a slower rate than for the Nation as a whole. It was the only State in the region to add to its share of total new construction from 1939 (1.4 percent) to 1947 (1.7 percent).

The Future

The outlook for construction in the East South Central States is very good for at least the next several years. In comparison with the Nation as a whole the region should at least maintain its position if not improve it. This would call for a considerable increase over the present physical volume of construction, but there is plenty of room for expansion. Public construction expenditures in some parts of the region are currently low, and, moreover, there is a sizable backlog of demand for homes, schools, recreation and other facilities in newly created industrial centers.

The outlook is most favorable in Tennessee. Although the postwar boom in industrial plant expansion seems to have tapered off (as evidenced by the slump in nonresidential construction in 1947), the war and postwar rise in urbanization has increased potentialities for residential building activity. Construction prospects in Alabama for the next few years are also good. Substantial gains were made in 1947 over 1946 in both residential and nonresidential construction, indicating that the transition from war to peacetime economy is well on its way toward completion. The outlook is especially good in and around the Birmingham area. With the great demand for steel, the Birmingham mills should be kept busy for some time to come. Lately enacted f.o.b. pricing has widened the market for Birmingham steel to include most of the South. In Mississippi—the most heavily rural State in the region—a trend toward a relative decline in construction may continue as surplus tenant farmers emigrate to more industrialized areas in other States. Kentucky is a more populous and industrialized State than Mississippi, but its war and postwar record do not show strong likelihood of increased construction activity for the

State as a whole. The Louisville area, on the other hand, should be more active.

The long-range construction outlook depends upon such factors as the prices of the region's farm products, the development of a more efficient agricultural system, and the extent of further industrialization. Farm prices are, of course, unpredictable. But in other respects there are definite probabilities of a brighter future. In the first place, it seems certain that farm mechanization will increase, resulting in a smaller farm population—particularly fewer tenant farmers—but with the higher average family incomes for those remaining. It also seems likely that new industries will continue to move into the region to take advantage of cheap power and abundant raw materials. The recent partial adjustment in freight rates on goods shipped out of the South to northern areas reduced a long-standing obstruction to southern industrial growth.

WEST SOUTH CENTRAL STATES

Summary

This is one of the most active construction regions in the country, mainly because of one State—Texas. The outlook is for continuing industrial development, and hence the prospects for increased construction activity are much better here than in older and more industrially mature regions.

Background

The four West South Central States—Arkansas, Louisiana, Oklahoma, and Texas—cover a vast but sparsely populated area, with 30 persons per square mile in 1940, as compared with an average of 44 for the Nation as a whole. Texas, by far the largest State, accounts for three-fifths of the land area and about one-half of the population. In spite of its wide open spaces, the Lone Star State was the most urban State in the region in 1940. Because of subsequent population changes, it seems likely that about half of the State's population, if not more, now lives in urban places. Of the sixteen metropolitan districts in the region, eleven are located in Texas.

Although the West South Central States are becoming more industrialized all the time, they are still mainly producers of raw materials. The region is rich in natural resources, such as petroleum, natural gas, salt, sulphur, and bauxite (aluminum ore). It is also one of the Nation's biggest farm producers. Cotton, wheat, grain sorghum, rice, citrus fruits, vegetables, and livestock are among the products that come from southwestern farms and ranches.

For many years cotton held first place in the region's economic set-up. But, in the thirties, increased attention was given to other agricultural activities, and the raising of livestock and feed for livestock reached new importance. By this time, petroleum extraction and refining had become important industries. Texas now supplies more oil than any other State in the country. Dallas, Tulsa, Oklahoma City, Houston, and some of the smaller southwestern cities benefited tremendously from the oil bonanza. Not only did petroleum itself bring spectacular fortunes but other products proved profitable as well. Natural gas, for instance, greatly increased the region's resources, and products of petroleum refining were an attraction for the synthetic chemical industry.

Although this is still far from being a great manufacturing region, its industrial development has been rapid in recent years. It got off to a slow start at the beginning of the prewar defense program. Most of the early industrial expansion took place in established centers of production on the Atlantic and Pacific coasts. But after this country entered the war, the West South Central States came in for a very large share of war industry. The abundance of raw materials and the comparative safety of its geographic location made the region an ideal place for the establishment of war plants. In the inland areas there were aircraft and synthetic rubber factories and bauxite and ordnance plants. And the deep-water ports—New Orleans, Houston, and Galveston—were busy with shipbuilding and ship repair. Naturally, at war's end many of these activities

slowed down or came to an abrupt halt. But the region emerged from the reconversion period much better off than before the war. Private enterprise has taken over many of the Government-financed plants. Some of the aircraft factories built during the war are still running on a fairly active schedule. Important peacetime industries (such as apparel, centered in Dallas) are providing more jobs than ever before.

Postwar Construction

In 1947, new construction in the West South Central States was valued at over a billion and a half dollars. Texas accounted for almost two-thirds of the total—more than 1 billion dollars worth. Next was Oklahoma, with new construction valued at 262 million dollars, whereas Louisiana and Arkansas had 188 million and 152 million dollars, respectively. Nonfarm private building made up about three-fifths of the regional construction bill; residential building alone, almost 40 percent. The remainder consisted of farm and public utility building, plus the various public construction projects.

The West South Central States were one of the two regions to increase their share of the Nation's construction substantially over the period 1939 to 1947. Their advance from 8.5 to 11.3 percent of the national bill was second only to that of the Pacific States. However, Texas was chiefly responsible for the regional gain. From 1939 to 1947, Texas rose from sixth to second place in State ranking of construction activity.

The spectacular construction gain made by the West South Central States and Texas in particular was caused to a large degree by an intraregional movement from farm to city. A large-scale farm exodus had begun some years before the war, as cotton production declined and southwestern farms became more mechanized. In those days most of the displaced tenant farmers migrated to other parts of the country. But once the war began, the surplus farm labor moved to the region's cities where they were quickly absorbed by newly expanding industries. The swelling city population created a serious need for additional houses and also for community facilities, both commercial and noncommercial—stores, schools, churches, recreational buildings, etc. Thus, a very favorable construction situation developed, even though from 1940 to 1948 the region's population increased at a slower rate than that of the Nation. In fact, one of the States, Arkansas, experienced an actual decline in population and at the same time added to its share of construction.

Table 17.—*Estimated expenditures for new construction, 1947 and 1939*

Region and State	Total new construction		Private residential building		Private nonresidential building		Public construction	
	1947	1939	1947	1939	1947	1939	1947	1939
	[Millions of dollars]							
West South Central	1585.6	538.7	616.9	150.7	318.5	62.1	314.7	225.0
Arkansas	151.5	45.0	51.7	7.6	20.1	6.3	33.5	19.9
Louisiana	188.4	104.6	60.9	24.3	40.9	9.9	43.7	59.8
Oklahoma	226.2	71.8	75.6	22.6	25.3	4.6	63.0	27.4
Texas	1019.5	317.3	428.7	96.2	232.2	41.3	174.5	117.9
	[Percent of U. S. total]							
West South Central	11.3	8.5	11.7	7.2	10.2	7.9	10.2	9.0
Arkansas	1.1	.7	1.0	.4	.6	.8	1.1	.8
Louisiana	1.3	1.7	1.2	1.2	1.3	1.3	1.4	2.4
Oklahoma	1.6	1.1	1.4	1.1	.8	.6	2.0	1.1
Texas	7.3	5.0	8.2	4.6	7.4	5.3	5.7	4.7

Source: U. S. Department of Commerce, Construction and Construction Materials, Statistical Supplement, June 1948, tables I, II, and III.

Construction activity increased most in Texas, primarily for two reasons. First, the State had a greater wartime industrial expansion than any of the other States. Second, it was here that the farm-to-city movement was strongest. Louisiana was the only State to show a relative construction decline; but this was principally because public expenditures in the State had not picked up by the postwar year 1947 to anywhere near their prewar relative position.

The Future

The outlook for construction in the West South Central States is one of continuing growth in the long run as well as in the more immediate future. Of course, even with recent gains, the region's construction market is comparatively small. It ranks fifth among the nine regions in the country. However, prospects for an increase over the present construction level are much more favorable here than in the older and more settled regions.

Construction in the West South Central States—as elsewhere—should be very active for at least the next several years. Moreover, this region's record should be better than the national average. In 1947, construction in the West South Central States was 194 percent above prewar, as compared with a 122 percent national gain, and the region may further outdo the Nation in the future. It is likely that its 1947 construction volume will be surpassed when postwar readjustments are completed.

Within the region, Texas will continue to account for the bulk of the construction activity. The State has done better than the other three on almost all counts — industrial expansion, population, and income gain, etc. Its favorable climate and highly developed agriculture are also in its favor.

The most active construction areas in the region are Houston and Dallas-Fort Worth—both centers of oil activity as well as various other industries. Other principal cities are San Antonio, Oklahoma City, Tulsa, and New Orleans. Of course, quite a bit of the residential construction in this predominantly rural region will be scattered around the numerous small cities and villages. Construction in Texas will tend to be concentrated in urban centers to a greater extent than in the other States.

MOUNTAIN STATES

Summary

The immediate and long-range outlook for construction employment is good, although the dollar value of construction expenditures will be low because of the sparse population. For most journeymen within these States, conservation and development projects are more important for their stimulation to the region's economy (with resulting construction) than for the construction employment immediately afforded.

Background

The eight Mountain States (Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, and Nevada) cover almost 858,000 square miles of land area—well over one-fourth of the United States total and approximately 350,000 square miles more than the next largest geographic division. The climate is arid and much of the land is mountainous, so that the population is small. Even though regional growth has well exceeded the national average for every decade, save one, since 1850, the population was only a little over 4 million in 1940—slightly more than 3 percent of the national total. Only one State, Colorado, had over a million people; no other was as large as 550,000, and two were below 500,000. The 1940 population represented a density of not quite 5 persons per square mile as compared with a national average of 44. There were about 11 persons per square mile in Colorado, 6 to 7 in Idaho and Utah, and less than 5 in all the other States.

In 1940, almost 43 percent of the inhabitants of the Mountain States lived in towns and cities of 2,500 or more[9], but there were few

[9] This percentage (of urbanization) is below those of New England and the Middle Atlantic, East North Central, West North Central, and Pacific States but above those of the South Atlantic, East South Central, and West South Central States.

large cities. Only four in 1940 had a population of 50,000 or over — Denver, Colorado (322,000); Salt Lake City, Utah (150,000); Phoenix, Arizona (65,000); and Pueblo, Colorado (52,000). Seven others were in the range from 25,000 up to 50,000. Two States in the region (Wyoming and Nevada) had no cities as large as 25,000.

Manufacturing plays a relatively small part in this sparsely populated region. Most, but not all, of the industrial development that has taken place is related to processing of basic materials—food, lumber, coal, oil, nonferrous metals (smelting operations), iron ore (steel manufacturing). In the beginning, the key to the region's growth was its mineral wealth. Gold, silver, copper, coal, and other minerals are still extracted in large quantities, but mining is now second to agriculture. Although the climate is very dry throughout most of the region, much of the land is fertile and, under irrigation, produces an abundance of grains, fruits, vegetables, and other crops. Grazing lands are extensive and in some sections livestock raising is on a par with crop farming. Another source of regional wealth is petroleum, which has come into prominence within recent years. The climate and scenic beauty of some parts of the region have given rise to a very lucrative tourist business. In these areas, tourist expenditures for accommodations and services of various kinds are very high in ordinary times.

The war had less permanent effect on the regional economic pattern here, than on the Pacific coast or some parts of the South, even though some of the Mountain States came in for a good share of war production activity. There was considerable wartime expansion of industrial facilities, such as aircraft, nonferrous metal, steel, and chemical plants, and some of these plants are being used for the production of peacetime goods. But to a considerable degree the boost was temporary. Except for a few large installations, such as the steel plants in Utah, there is not much evidence of increased industrial capacity suited to peacetime needs.

Postwar Construction

In 1947, the dollar volume of total new construction activity in this region amounted to approximately 574 million dollars, or 4.1 percent of the national bill. Colorado, the leading State, had a little over 139 million dollars worth of construction; Arizona was second with 101 million dollars, and New Mexico third with 69 million dollars. Among the five remaining States, new construction expenditures ranged from 36 million dollars in Nevada to a little over 66 million dollars in Utah.

About 65 percent of the regional construction bill went for privately financed construction. About 158 million dollars of this was spent for residential building, 87 million dollars for factories, stores, offices, and the like, and the rest for farm and public utility construction. Public construction expenditures accounted for a much smaller percentage of the total than they normally do. In 1947, only slightly more than 34 percent of the new construction put in place was publicly financed, as compared with about 57 percent in 1939.

From 1939 to 1947 the Mountain States' share of the Nation's construction went down from 4.6 percent to 4.1 percent, but this is not an indication of a permanent loss. Relative gains were made in private residential and nonresidential building, but publicly financed construction was low in comparison with prewar. The region's share of national expenditures for conservation and development fell from 21 percent in 1939 to 18 percent in 1947. Such projects are much more extensive in the Mountain States than in other parts of the country, except for the Pacific States; and, because of the small population, their effect on total construction activity is much greater in this region than elsewhere.

The Future

The immediate outlook for construction in the Mountain States is very favorable; 1948 will probably turn out to be a much better construction year for the region than 1947. Expenditures for conservation and development projects began to pick up considerably in 1947, as compared with the previous year, and further gains should be made in this type of construction. A booming tourist business is acting as a fillip to the whole regional economy, as well as a direct stimulus to construction activity; and, because of population increase, the demand for residential building is good. As elsewhere, the volume of construction activity

Table 18.—*Estimated expenditures for new construction, 1947 and 1939*

Region and State	Total new construction		Private residential building		Private nonresidential building		Total public construction		Conservation and development	
	1947	1939	1947	1939	1947	1939	1947	1939	1947	1939
	[Millions of dollars]									
Mountain	574.3	289.3	157.9	54.0	86.5	18.2	196.2	165.7	70.1	65.1
Montana	64.0	48.0	10.3	4.9	9.2	2.2	24.0	33.7	10.6	19.6
Idaho	59.0	23.4	14.8	4.9	8.4	1.2	19.0	9.8	9.0	1.3
Wyoming	40.6	27.9	5.9	3.6	2.3	1.8	22.5	14.8	9.3	6.4
Colorado	139.0	66.1	42.2	14.6	21.2	4.4	44.0	36.7	16.3	8.4
New Mexico	68.7	32.1	19.6	5.1	10.2	1.8	22.1	17.7	4.0	7.6
Arizona	100.9	41.6	21.8	7.0	18.0	2.6	39.2	28.3	15.8	13.9
Utah	66.4	33.1	26.4	9.9	12.4	2.4	15.1	14.9	2.6	3.2
Nevada	35.7	17.1	16.9	4.0	4.8	1.8	10.3	9.8	2.5	4.7
	[Percent of U. S. total]									
Mountain	4.1	4.6	3.0	2.6	2.7	2.3	6.3	6.6	17.7	21.0
Montana	.5	.8	.2	.2	.3	.3	.8	1.3	2.7	6.3
Idaho	.4	.4	.3	.2	.3	.2	.6	.4	2.3	.4
Wyoming	.3	.4	.1	.2	.1	.2	.7	.6	2.3	2.1
Colorado	1.0	1.0	.8	.7	.7	.6	1.4	1.5	4.1	2.7
New Mexico	.5	.5	.4	.2	.3	.2	.7	.7	1.0	2.5
Arizona	.7	.7	.4	.3	.6	.3	1.3	1.1	4.0	4.5
Utah	.5	.5	.5	.5	.4	.3	.5	.6	.7	1.0
Nevada	.3	.3	.3	.2	.2	.2	.3	.4	.6	1.5

Source: U. S. Department of Commerce, Construction and Construction Materials, Statistical Supplement, June 1948, tables I, II, and III.

is heavily dependent upon national prosperity. In the event of a depression and the slump in demand for heavy goods which inevitably goes with it, the region's mining industry and its expanded steel industry would be especially hard hit.

Although the dollar volume of construction in the Mountain States is relatively small and will be for some time to come, the long-range outlook is one of continued expansion. The region is the nearest approach to a frontier in this country and is still in a primary state of industrial development. The basic industries are agriculture and the extractive industries—mining of metal and coal, lumbering, and oil drilling. Further development of oil and coal resources may be expected. Manufacturing beyond the primary processing of raw materials is not extensive, and most of the more highly manufactured goods consumed in the region are made elsewhere. Consequently, in the years to come, the Mountain States should increase their share of the Nation's population, income, employment, and construction, in contrast to the highly industrialized States which have already reached full maturity and begun to decline in relative importance.

In the long run, conservation and development projects will give an indirect boost to construction through their effect on the over-all regional economy. Extensive irrigation, power, and flood control projects are now under way and others are certain to follow, although the timing for these latter is unpredictable more than a short time in the future. As these projects come about, economic life of all sorts will be stimulated: more land will be made available for farming; more manufacturing will come into the region; population and construction activity will increase. It should be noted, however, that conservation and development projects are less significant than their size might indicate, from the standpoint of direct employment of people living near them or even within the region. Since such jobs are

usually in sparsely populated localities, a work camp is customary and most of the workers must come from elsewhere. The labor force on such a project commonly includes a high percentage of unattached persons from distant parts of the country. Journeymen living beyond commuting distance of the project and having family responsibilities ordinarily prefer to work on small jobs near their homes. Their employment prospect may be improved, however, by migration of other local journeymen to the project.

PACIFIC STATES

Summary

Prospects for the volume of construction employment in the near future are excellent and, on a long-range basis, are much better than for the Nation as a whole. Until the in-migrants of recent years are fairly well assimilated, construction employment will be dependent on a high general level of prosperity to a considerably greater degree in this region than elsewhere.

Background

The three Pacific States—California, Washington, and Oregon—constitute a closely integrated region, with a favorable climate, many resources, and a highly developed agricultural economy. For many years population in the West Coast States (particularly California) has been growing at a much faster rate than in the Nation as a whole. The region's well-irrigated farms, expanding oil production, its lumber and its young industries have attracted a continuous stream of migrants. In-migration was especially heavy during the drought of the middle thirties when thousands moved in from "Dust Bowl" areas between the Mississippi and the Rockies. From 1930 to 1940 there was a regional population increase of 19 percent. But a greater wave of migration took place during and following the war. Population grew by leaps and bounds as newcomers came into the region to work in its aircraft plants, shipyards and other war industries, and in its army camps and naval bases; the influx has continued to the present. It is estimated that in July 1948 civilian population in the Pacific States was 44.4 percent above 1940, compared with a national increase of 10.6 percent. No other regional group even approached this record. The increases were over 40 percent for each State—44.3 for California, 49.3 for Oregon, and 41.6 for Washington.

California accounts for about one-half of the region's land area, over 70 percent of its population, and approximately the same proportion of its factory jobs. Its population in 1940 represented a density of 44 persons per square mile, compared with a concentration of 30 persons per square mile in Washington and 11 in Oregon. However, regional differences are more accurately presented when State boundaries are ignored. The bulk of California's population and industry are concentrated in the southern and central parts, extending from the Mexican border north as far as San Francisco Bay and Sacramento. This section includes the Imperial Valley and other noted fruit-growing and truck-farming areas. Northern California, Washington, and Oregon are much alike. Although there are good fruit growing, farming, and grazing tracts in some sections, a large part of this country is covered with thick forests. This is the Nation's source of several important kinds of lumber (Douglas fir, western pine, redwood, and others) and of softwood plywood. It is also the leading source of some kinds of sea food.

The bulk of the wartime migration was to the region's four leading metropolitan districts, each of which was an important war production center. The Los Angeles metropolitan area, the largest, had a population of over 3 million in 1940, the San Francisco-Oakland area had about a million and a half, and Seattle, Washington, and Portland, Oregon, had a little over 400,000 people each. Undoubtedly these are much larger now. Although there were wholesale lay-offs in aircraft and shipbuilding, the transition to a peacetime economy was fairly smooth. Instead of the expected large-scale exodus of workers, further in-migration took place after the war was over.

Although factory employment and total employment in the region are below the wartime peak, they are nevertheless considerably above prewar. Peacetime industries are offering more jobs than before, and many of the war plants are being used for the production of consumer goods. Trade and service establishments—an important segment of the region's economy—were particularly short-handed during the war and began hiring as soon as workers were released from war industries. Also, when the war ended, the tourist trade began to get back on its feet, and private homebuilders got back to business in a big way. Food production, lumber and oil production, major peacetime industries which expanded during the war, continued to find ready markets. Among the war-created plants, iron and steel, nonferrous metal, machine tool and electrical equipment factories have been converted to the manufacture of peacetime products. Aluminum manufacturing continues to be active, and the metal industry in general seems to have been permanently stimulated by the war. Not only is there more manufacturing than before the war but there has also been an increase in the volume of manufacturing for Nation-wide markets and of assembling or manufacturing for the western markets in branch plants of national firms. Women's clothing manufactured in and near Los Angeles is now distributed throughout the country. Doors and other stock millwork items from the northwestern part of the region are important older manufactures for the national market.

Postwar Construction

In 1947, expenditures for all types of new construction in the Pacific States amounted to almost 2.4 billion dollars. The region was second only to the East North Central States in total dollar volume of new construction; and California, with over 1.8 billion dollars, ranked first among all States. The other Pacific States, Washington and Oregon, had 358 million and 196 million dollars, respectively.

The region led all others in the value of nonfarm residential building. Almost half of the total regional bill (or about 1.2 billion dollars) went for this type of building. A little over 515 million dollars was spent for nonresidential buildings (factories, stores, offices, etc.). In nonresidential building, the Pacific States, as a group, were outranked by both the East North Central and Middle Atlantic States; but California led all other States individually.

Over the period from 1939 to 1947, the Pacific States made greater construction gains than any other region. The three States combined increased their portion of construction activity from 13.5 to 17.1 percent of the na-

Table 19.—*Estimated expenditures for new construction, 1947 and 1939*

Region and State	Total new construction		Private residential building		Private nonresidential building		Public construction	
	1947	1939	1947	1939	1947	1939	1947	1939
	[Millions of dollars]							
Pacific	2388.1	850.3	1157.9	364.2	515.3	112.1	454.1	291.6
Washington	358.0	121.0	125.0	24.9	50.7	11.4	119.3	71.4
Oregon	195.7	62.0	79.0	14.4	49.0	6.8	43.4	32.0
California	1834.4	667.3	953.9	324.9	415.6	93.9	291.4	188.2
	[Percent of U. S. total]							
Pacific	17.1	13.5	22.0	17.2	16.0	14.3	14.7	11.7
Washington	2.6	1.9	2.4	1.2	1.6	1.5	3.9	2.9
Oregon	1.4	1.0	1.5	.7	1.5	.9	1.4	1.3
California	13.1	10.6	18.1	15.4	12.9	12.0	9.4	7.5

Source: U. S. Department of Commerce, Construction and Construction Materials, Statistical Supplement, June 1948, tables I, II, and III.

tional total. The region was one of the two that came out of the war and the initial impact of reconversion with a significant advance in the relative volume of construction. All other regions, except the West South Central States, either lost in relative standing or at most made slight gains. Among the Pacific States, California increased its share of the country's total construction from 10.6 percent in 1939 to 13.1 percent in 1947, the largest relative gain registered by any State. Washington and Oregon likewise substantially increased their portions of the national total.

The exceedingly high construction rate reflects the huge accumulated demand for additional houses, stores, and community facilities created by a decade of in-migration. The housing shortage has been especially acute in and around the major West Coast cities. Los Angeles is the most active construction area in the United States. To illustrate, in 1947, Los Angeles led all cities in the country in the value of building permits issued. The city was at the top in residential construction, stores and other mercantile buildings, office and bank buildings, and public buildings.

The Future

As long as prosperity continues, the building industry will be more active in the Pacific States than anywhere else in the country. Because of expanding population, it is there that building needs (residential building in particular) are most acute. The accumulated backlog is large enough to keep the volume of building high for some time to come. But the translation of this need into active demand (and hence the continuation of the building boom) is heavily dependent upon national prosperity.

Over the long run, it is likely that construction in the Pacific Coast States will continue to operate at a higher level than in the Nation as a whole. Still a comparatively young, growing region, the Pacific States are becoming more industrialized. The war hastened this process and brought a permanent advance in the region's economy. However, despite favorable long-range prospects, construction will probably be more susceptible to business ups and downs in this part of the country than elsewhere. Formerly, the West Coast seemed to have had some immunity against depression—especially short-lived recessions. The slow-moving property income of the wealthy and the fixed income of retired people acted as a cushion against fluctuations in business activity. But—principally because of gains made in factory employment since the beginning of the war—these stabilizing influences are less significant than in the past. Moreover, wages will become an increasingly important part of regional income as industrial development continues. The large wartime influx of population is another unstabilizing influence. As a result of large-scale in-migration, a much greater proportion of the working population is now dependent upon a full-employment, high-wage economy. This is probably more true in a region with so many recent migrants than in older industrialized parts of the country where the industrial population has more firmly established personal ties.

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