

Highest Paying Jobs That Don't Require A College Degree

Table of Contents

<u>Auto Mechanics</u>	2
<u>Carpenters</u>	9
<u>Welders</u>	13
<u>Electricians</u>	18
<u>Firefighters</u>	23
<u>Food Service Managers</u>	28
<u>Plumbers and Pipe Fitters</u>	34
<u>Telecommunications Equipment Installers/Repairers</u>	39
<u>Electronics Technicians</u>	43
<u>Postal Service Workers</u>	50
<u>Truck Drivers</u>	54
<u>Police Officers</u>	62
<u>Power Plant Operators</u>	70
<u>Carpet and Tile Setters</u>	73
<u>Line Repairers and Installers</u>	79
<u>Rail Transportation Workers</u>	84
<u>Real Estate Agents</u>	90
<u>Brick Masons and Stonemasons</u>	95
<u>Drywall Installers</u>	100
<u>Executive Secretaries / Administrative Assistants</u>	104

*Data Compiled from the Federal Government's
Bureau of Labor Statistics by Resumagic.com
Statistics are for the years 2002 - 2012*

Significant Points

- Formal automotive technician training is the best preparation for these challenging technology-based jobs.
- Opportunities should be very good for automotive service technicians and mechanics with diagnostic and problem-solving skills and knowledge of electronics and mathematics.
- Automotive service technicians and mechanics must continually adapt to changing technology and repair techniques as vehicle components and systems become increasingly sophisticated.

Nature of the Work

Anyone whose car or light truck has broken down knows the importance of the jobs of automotive service technicians and mechanics. The ability to diagnose the source of a problem quickly and accurately requires good reasoning ability and a thorough knowledge of automobiles. Many technicians consider diagnosing hard-to-find troubles one of their most challenging and satisfying duties.

The work of automotive service technicians and mechanics has evolved from mechanical repair to a high technology job. Today, integrated electronic systems and complex computers run vehicles and measure their performance while on the road. Technicians must have an increasingly broad base of knowledge about how vehicles' complex components work and interact, as well as the ability to work with electronic diagnostic equipment and computer-based technical reference materials.

Automotive service technicians and mechanics use their high-tech skills to inspect, maintain, and repair automobiles and light trucks that have gasoline engines. The increasing sophistication of automotive technology now requires workers who can use computerized shop equipment and work with electronic components while maintaining their skills with traditional handtools.

When mechanical or electrical troubles occur, technicians first get a description of the symptoms from the owner or, if they work in a large shop, the repair service estimator who wrote the repair order. To locate the problem, technicians use a diagnostic approach. First, they test to see whether components and systems are proper and secure. Then, they isolate the components or systems that could not logically be the cause of the problem. For example, if an air-conditioner malfunctions, the technician's diagnostic approach can pinpoint a problem as simple as a low coolant level or as complex as a bad drive-train connection that has shorted out the air conditioner. Technicians may have to test drive the vehicle or use a variety of testing equipment, such as onboard and hand-held diagnostic computers or compression gauges, to identify the source of the problem. These tests may indicate whether a component is salvageable or whether a new one is required to get the vehicle back in working order.

During routine service inspections, technicians test and lubricate engines and other major components. In some cases, the technician may repair or replace worn parts before they cause breakdowns that could damage critical components of the vehicle.

Technicians usually follow a checklist to ensure that they examine every critical part. Belts, hoses, plugs, brake and fuel systems, and other potentially troublesome items are among those closely watched.

Service technicians use a variety of tools in their work—power tools, such as pneumatic wrenches to remove bolts quickly; machine tools like lathes and grinding machines to rebuild brakes; welding and flame-cutting equipment to remove and repair exhaust systems, and jacks and hoists to lift cars and engines. They also use common handtools, such as screwdrivers, pliers, and wrenches, to work on small parts and in hard-to-reach places.

In modern repair shops, service technicians compare the readouts from diagnostic testing devices with the benchmarked standards given by the manufacturer of the components being tested. Deviations outside of acceptable levels are an indication to the technician that further attention to an area is necessary. The testing devices diagnose problems and make precision adjustments with calculations downloaded from large computerized databases. The computerized systems provide automatic updates to technical manuals and unlimited access to manufacturers' service information, technical service bulletins, and other databases that allow technicians to keep current on problem spots and to learn new procedures.

Automotive service technicians in large shops have increasingly become specialized. For example, *transmission technicians and rebuilders* work on gear trains, couplings, hydraulic pumps, and other parts of transmissions. Extensive knowledge of computer controls, the ability to diagnose electrical and hydraulic problems, and other specialized skills are needed to work on these complex components, which employ some of the most sophisticated technology used in vehicles. *Tuneup technicians* adjust the ignition timing and valves, and adjust or replace spark plugs and other parts to ensure efficient engine performance. They often use electronic testing equipment to isolate and adjust malfunctions in fuel, ignition, and emissions control systems.

Automotive air-conditioning repairers install and repair air-conditioners and service their components, such as compressors, condensers, and controls. These workers require special training in Federal and State regulations governing the handling and disposal of refrigerants. *Front-end mechanics* align and balance wheels and repair steering mechanisms and suspension systems. They frequently use special alignment equipment and wheel-balancing machines. *Brake repairers* adjust brakes, replace brake linings and pads, and make other repairs on brake systems. Some technicians and mechanics specialize in both brake and front-end work.

Working Conditions

About half of automotive service technicians work a standard 40-hour week, but almost 30 percent work more than 40 hours a week. Many of those working extended hours are self-employed technicians. To satisfy customer service needs, some service shops offer evening and weekend service. Generally, service technicians work indoors in well-ventilated and -lighted repair shops. However, some shops are drafty and noisy. Although they fix some problems with simple computerized adjustments, technicians frequently work with dirty and greasy parts, and in awkward positions. They often lift heavy parts and tools. Minor cuts, burns,

and bruises are common, but technicians usually avoid serious accidents when the shop is kept clean and orderly and safety practices are observed.

Employment

Automotive service technicians and mechanics held about 818,000 jobs in 2002. The majority worked for automotive repair and maintenance shops, automobile dealers, and retailers and wholesalers of automotive parts, accessories, and supplies. Others found employment in gasoline stations; home and auto supply stores; automotive equipment rental and leasing companies; Federal, State, and local governments; and other organizations. About 16 percent of service technicians were self-employed, more than twice the proportion for all installation, maintenance, and repair occupations.

Training, Other Qualifications and Advancement

Automotive technology is rapidly increasing in sophistication, and most training authorities strongly recommend that persons seeking automotive service technician and mechanic jobs complete a formal training program in high school or in a postsecondary vocational school. However, some service technicians still learn the trade solely by assisting and learning from experienced workers.

Many high schools, community colleges, and public and private vocational and technical schools offer automotive service technician training programs. The traditional postsecondary programs usually provide a thorough career preparation that expands upon the student's high school repair experience.

Postsecondary automotive technician training programs vary greatly in format, but normally provide intensive career preparation through a combination of classroom instruction and hands-on practice. Some trade and technical school programs provide concentrated training for 6 months to a year, depending on how many hours the student attends each week. Community college programs normally spread the training over 2 years; supplement the automotive training with instruction in English, basic mathematics, computers, and other subjects; and award an associate degree or certificate. Some students earn repair certificates and opt to leave the program to begin their career before graduation. Recently, some programs have added to their curriculums training on employability skills such as customer service and stress management. Employers find that these skills help technicians handle the additional responsibilities of dealing with the customers and parts vendors.

High school programs, while an asset, vary greatly in quality. The better programs, such as the Automotive Youth Education Service (AYES), with about 150 participating schools and more than 300 participating dealers, conclude with the students receiving their technician's certification and high school diploma. Other programs offer only an introduction to automotive technology and service for the future consumer or hobbyist. Still others aim to equip graduates with enough skills to get a job as a mechanic's helper or trainee mechanic.

The various automobile manufacturers and their participating dealers sponsor 2-year associate degree programs at postsecondary schools across the Nation. The Accrediting Commission of Career Schools and Colleges of Technology (ACCSCCT) currently certifies a number of automotive and diesel technology schools. Schools

update their curriculums frequently to reflect changing technology and equipment. Students in these programs typically spend alternate 6- to 12-week periods attending classes full time and working full time in the service departments of sponsoring dealers. At these dealerships, students get practical experience while assigned to an experienced worker who provides hands-on instruction and timesaving tips.

The National Automotive Technicians Education Foundation (NATEF), an affiliate of the National Institute for Automotive Service Excellence (ASE), establishes the standards by which training facilities become certified. Once the training facility achieves these minimal standards, NATEF recommends the facility to ASE for certification. The ASE certification is a nationally recognized standard for programs offered by high schools, postsecondary trade schools, technical institutes, and community colleges that train automobile service technicians. Automotive manufacturers provide ASE certified instruction, service equipment, and current-model cars on which students practice new skills and learn the latest automotive technology. While ASE certification is voluntary, it does signify that the program meets uniform standards for instructional facilities, equipment, staff credentials, and curriculum. To ensure that programs keep up with ever-changing technology, repair techniques, and ASE standards, the certified programs are subjected to periodic compliance reviews and mandatory recertification. NATEF program experts also review and update program standards to match the level of training and skill-level achievement necessary for success in the occupation. In 2002, about 1,200 high school and postsecondary automotive service technician training programs had been certified by ASE.

For trainee automotive service technician jobs, employers look for people with strong communication and analytical skills. Technicians need good reading, mathematics, and computer skills to study technical manuals and to keep abreast of new technology and learn new service and repair procedures and specifications. Trainees also must possess mechanical aptitude and knowledge of how automobiles work. Most employers regard the successful completion of a vocational training program in automotive service technology as the best preparation for trainee positions. Experience working on motor vehicles in the Armed Forces or as a hobby also is valuable. Because of the complexity of new vehicles, a growing number of employers require completion of high school and additional postsecondary training. Courses in automotive repair, electronics, physics, chemistry, English, computers, and mathematics provide a good educational background for a career as a service technician.

Many new cars have several onboard computers, operating everything from the engine to the radio. Some of the more advanced vehicles have global positioning systems, Internet access, and other high-tech features integrated into the functions of the vehicle. Therefore, knowledge of electronics and computers has grown increasingly important for service technicians. Engine controls and dashboard instruments were among the first components to use electronics but, now, everything from brakes to transmissions and air-conditioning systems to steering systems is run primarily by computers and electronic components. In the past, a specialist usually handled any problems involving electrical systems or electronics. Now that electronics are so common, it is essential for service technicians to be familiar with at least the basic principles of electronics. Electrical components or a series of related components account for nearly all malfunctions in modern vehicles.

In addition to electronics and computers, automotive service technicians will have to learn and understand the science behind the alternate-fuel vehicles that have begun to enter the market. The fuel for these vehicles will come from the dehydrogenization of water, electric fuel cells, natural gas, solar power, and other nonpetroleum-based sources. Some vehicles will even capture the energy from brakes and use it as fuel. As vehicles with these new technologies become more common, technicians will need additional training to learn the science and engineering that makes them possible.

Beginners usually start as trainee technicians, mechanics' helpers, lubrication workers, or gasoline service station attendants, and gradually acquire and practice their skills by working with experienced mechanics and technicians. With a few months' experience, beginners perform many routine service tasks and make simple repairs. It usually takes 2 to 5 years of experience to become a journey-level service technician, who is expected to quickly perform the more difficult types of routine service and repairs. However, some graduates of postsecondary automotive training programs are often able to earn promotion to the journey level after only a few months on the job. An additional 1 to 2 years of experience familiarizes mechanics and technicians with all types of repairs. Difficult specialties, such as transmission repair, require another year or two of training and experience. In contrast, brake specialists may learn their jobs in considerably less time because they do not need a complete knowledge of automotive repair.

In the past, many persons became automotive service technicians through 3- or 4-year formal apprenticeship programs. However, apprenticeships have become rare, as formal vocational training programs in automotive service technology have become more common.

At work, the most important possessions of technicians and mechanics are their handtools. Technicians and mechanics usually provide their own tools, and many experienced workers have thousands of dollars invested in them. Employers typically furnish expensive power tools, engine analyzers, and other diagnostic equipment, but technicians accumulate handtools with experience. Some formal training programs have alliances with tool manufacturers that help entry-level technicians accumulate tools during their training period.

Employers increasingly send experienced automotive service technicians to manufacturer training centers to learn to repair new models or to receive special training in the repair of components, such as electronic fuel injection or air-conditioners. Motor vehicle dealers also may send promising beginners to manufacturer-sponsored mechanic training programs. Employers typically furnish this additional training to maintain or upgrade employees' skills and thus increase the employees' value to the dealership. Factory representatives also visit many shops to conduct short training sessions.

Voluntary certification by the National Institute for Automotive Service Excellence (ASE) has become a standard credential for automotive service technicians. Certification is available in 1 or more of 8 different service areas, such as electrical systems, engine repair, brake systems, suspension and steering, and heating and air-conditioning. For certification in each area, technicians must have at least 2 years of experience and pass a written examination. Completion of an automotive training program in high school, vocational or trade school, or community or junior college may be substituted for 1 year of experience. In some cases, graduates of ASE-

certified programs achieve certification in up to three specialties. For certification as a master automotive mechanic, technicians must be certified in all eight areas. Mechanics and technicians must retake each examination at least once every 5 years to maintain their certifications.

Experienced technicians who have leadership ability sometimes advance to shop supervisor or service manager. Those who work well with customers may become automotive repair service estimators. Some with sufficient funds open independent repair shops.

Job Outlook

Job opportunities in this occupation are expected to be very good for persons who complete automotive training programs in high school, vocational and technical schools, or community colleges. Persons with good diagnostic and problem-solving skills, and whose training includes basic electronics skills, should have the best opportunities. For well-prepared people with a technical background, automotive service technician careers offer an excellent opportunity for good pay and the satisfaction of highly skilled work with vehicles incorporating the latest in high technology. However, persons without formal automotive training are likely to face competition for entry-level jobs.

Employment of automotive service technicians and mechanics is expected to increase about as fast as the average through the year 2012. Over the 2002-12 period, population growth will boost demand for motor vehicles, which will require regular maintenance and service. Growth of the labor force and in the number of families in which both spouses need vehicles to commute to work will contribute to increased vehicle sales and employment in this industry. As personal incomes continue to rise, greater numbers of persons will be able to afford the luxury of owning multiple vehicles, which also should increase the number of passenger cars in operation. However, a slowdown in the growth of the driving-age population, as the smaller post-baby boom generation comes of age, may curb demand for cars and trucks. In addition, increasing demand due to growth in the number of vehicles in operation will be partially offset by improvements in vehicle quality and durability that improve reliability and reduce the need for extensive repair and maintenance.

Employment growth will continue to be concentrated in automobile dealerships and independent automotive repair shops. Many new jobs also will be created in small retail operations that offer after-warranty repairs, such as oil changes, brake repair, air-conditioner service, and other minor repairs generally taking less than 4 hours to complete. Employment of automotive service technicians and mechanics in gasoline service stations will continue to decline, as fewer stations offer repair services.

In addition to job openings due to growth, a substantial number of openings will be created by the need to replace experienced technicians who transfer to other occupations or who retire or stop working for other reasons. Most persons who enter the occupation can expect steady work, because changes in general economic conditions and developments in other industries have little effect on the automotive repair business.

Earnings

Median hourly earnings of automotive service technicians and mechanics, including commission, were \$14.71 in 2002. The middle 50 percent earned between \$10.61 and \$19.84. The lowest 10 percent earned less than \$8.14, and the highest 10 percent earned more than \$25.21. Median annual earnings in the industries employing the largest numbers of service technicians in 2002 were as follows:

Local government	\$18.04
Automobile dealers	17.66
Gasoline stations	13.04
Automotive repair and maintenance	12.77
Automotive parts, accessories, and tire stores	12.60

Many experienced technicians employed by automobile dealers and independent repair shops receive a commission related to the labor cost charged to the customer. Under this method, weekly earnings depend on the amount of work completed. Employers frequently guarantee commissioned mechanics and technicians a minimum weekly salary.

Some automotive service technicians are members of labor unions such as the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters.

Sources of Additional Information

For more details about work opportunities, contact local automobile dealers and repair shops or local offices of the state employment service. The state employment service also may have information about training programs.

- National Automotive Technicians Education Foundation, 101 Blue Seal Dr., SE., Suite 101, Leesburg, VA 20175. Internet: <http://www.natef.org>
- Accrediting Commission of Career Schools and Colleges of Technology, 2101 Wilson Blvd., Suite 302, Arlington, VA 22201 Internet: <http://www.accsct.org>
- SkillsUSA-VICA, P.O. Box 3000, Leesburg, VA 20177-0300. Internet: <http://www.skillsusa.org>
- Automotive Youth Educational Systems (AYES), 50 W. Big Beaver, Suite 145, Troy, MI 48084. Internet: <http://www.eyes.org>
- National Institute for Automotive Service Excellence (ASE), 101 Blue Seal Dr. SE., Suite 101, Leesburg, VA 20175. Internet: <http://www.asecert.org>
- National Automobile Dealers Association, 8400 Westpark Dr., McLean, VA 22102. Internet: <http://www.nada.org>
- Automotive Retailing Today, 8400 Westpark Dr., MS #2, McLean, VA 22102. Internet: <http://www.autoretailing.org>

Significant Points

- About 30 percent of all carpenters—the largest construction trade in 2002—were self-employed.
- Job opportunities should be excellent.
- Carpenters with all-round skills will have the best opportunities for steady work.

Nature of Work

Carpenters are involved in many different kinds of construction activity. They cut, fit, and assemble wood and other materials for the construction of buildings, highways, bridges, docks, industrial plants, boats, and many other structures. Carpenters' duties vary by type of employer. Builders increasingly are using specialty trade contractors who, in turn, hire carpenters who specialize in just one or two activities. Such activities include setting forms for concrete construction; erecting scaffolding; or doing finishing work, such as installing interior and exterior trim. However, a carpenter directly employed by a general building contractor often must perform a variety of the tasks associated with new construction, such as framing walls and partitions, putting in doors and windows, building stairs, laying hardwood floors, and hanging kitchen cabinets. Carpenters also build brattices (ventilation walls or partitions) in underground passageways to control the proper circulation of air through these passageways and to worksites.

Because local building codes often dictate where certain materials can be used, carpenters must know these regulations. Each carpentry task is somewhat different, but most involve the same basic steps. Working from blueprints or instructions from supervisors, carpenters first do the layout—measuring, marking, and arranging materials. They cut and shape wood, plastic, fiberglass, or drywall, using hand and power tools, such as chisels, planes, saws, drills, and sanders. They then join the materials with nails, screws, staples, or adhesives. In the final step, carpenters check the accuracy of their work with levels, rules, plumb bobs, and framing squares, and make any necessary adjustments. When working with prefabricated components, such as stairs or wall panels, the carpenter's task is somewhat simpler than above, because it does not require as much layout work or the cutting and assembly of as many pieces. Prefabricated components are designed for easy and fast installation and generally can be installed in a single operation.

Carpenters who remodel homes and other structures must be able to do all aspects of a job—not just one task. Thus, individuals with good basic overall training are at a distinct advantage, because they can switch from residential building to commercial construction or remodeling work, depending on which offers the best work opportunities.

Carpenters employed outside the construction industry perform a variety of installation and maintenance work. They may replace panes of glass, ceiling tiles, and doors, as well as repair desks, cabinets, and other furniture. Depending on the employer, carpenters install partitions, doors, and windows; change locks; and repair

broken furniture. In manufacturing firms, carpenters may assist in moving or installing machinery.

Working Conditions

As is true of other building trades, carpentry work is sometimes strenuous. Prolonged standing, climbing, bending, and kneeling often are necessary. Carpenters risk injury working with sharp or rough materials, using sharp tools and power equipment, and working in situations where they might slip or fall. Additionally, many carpenters work outdoors.

Some carpenters change employers each time they finish a construction job. Others alternate between working for a contractor and working as contractors themselves on small jobs.

Employment

Carpenters, who make up the largest building trades occupation, held about 1.2 million jobs in 2002. One-third worked for general building contractors and one-fifth worked for special trade contractors. Most of the rest of the wage and salary workers worked for manufacturing firms, government agencies, retail establishments and a wide variety of other industries. About 30 percent of all carpenters were self-employed.

Training, Other Qualifications, and Advancement

Carpenters learn their trade through on-the-job training, as well as formal training programs. Most pick up skills informally by working under the supervision of experienced workers. Many acquire skills through vocational education. Others participate in employer training programs or apprenticeships.

Most employers recommend an apprenticeship as the best way to learn carpentry. Apprenticeship programs are administered by local joint union-management committees of the United Brotherhood of Carpenters and Joiners of America, the Associated General Contractors, Inc., and the National Association of Home Builders. In addition, training programs are administered by local chapters of the Associated Builders and Contractors and by local chapters of the Associated General Contractors, Inc. These programs combine on-the-job training with related classroom instruction.

On the job, apprentices learn elementary structural design and become familiar with common carpentry jobs, such as layout, form building, rough framing, and outside and inside finishing. They also learn to use the tools, machines, equipment, and materials of the trade. Apprentices receive classroom instruction in safety, first aid, blueprint reading, freehand sketching, basic mathematics, and different carpentry techniques. Both in the classroom and on the job, they learn the relationship between carpentry and the other building trades.

Usually, apprenticeship applicants must be at least 18 years old and meet local requirements. For example, some union locals test an applicant's aptitude for carpentry. The length of the program, usually 3 to 4 years, varies with the

apprentice's skill. Because the number of apprenticeship programs is limited, however, only a small proportion of carpenters learn their trade through these programs.

Informal on-the-job training is normally less thorough than an apprenticeship. The degree of training and supervision often depends on the size of the employing firm. A small contractor specializing in homebuilding may provide training only in rough framing. In contrast, a large general contractor may provide training in several carpentry skills. Although specialization is becoming increasingly common, it is important to try to acquire skills in all aspects of carpentry and to have the flexibility to perform any kind of work.

A high school education is desirable, including courses in carpentry, shop, mechanical drawing, and general mathematics. Manual dexterity, eye-hand coordination, physical fitness, and a good sense of balance are important. The ability to solve arithmetic problems quickly and accurately also is helpful. Employers and apprenticeship committees generally view favorably any construction-related training and work experience obtained in the Armed Services or Job Corps.

Carpenters may advance to carpentry supervisor or general construction supervisor positions. Carpenters usually have greater opportunities than most other construction workers to become general construction supervisors, because carpenters are exposed to the entire construction process. Some carpenters become independent contractors. To advance, these workers should be able to identify and estimate the quantity of materials needed to properly complete a job. In addition, they must be able to accurately estimate how long a job should take to complete and what it will cost.

Job Outlook

Job opportunities for carpenters are expected to be excellent over the 2002-12 period, largely due to the numerous openings arising each year as experienced carpenters leave this large occupation. Contributing to this favorable job market is the fact that many potential workers prefer work that is less strenuous and that has more comfortable working conditions. Because there are no strict training requirements for entry, many people with limited skills take jobs as carpenters but eventually leave the occupation because they dislike the work or cannot find steady employment.

Employment of carpenters is expected to grow about as fast as average for all occupations through 2012. Construction activity should increase in response to demand for new housing and commercial and industrial plants and the need to renovate and modernize existing structures. The demand for larger homes with more amenities and for second homes will continue to rise, especially as the baby boomers reach their peak earning years and can afford to spend more on housing. At the same time, the demand for manufactured housing, starter homes, and rental apartments also is expected to increase as the number of immigrants grows and as the relatively small baby bust generation, which followed the baby boom generation, is replaced by echo boomers (the children of the baby boomers) in the young adult age groups.

However, some of the demand for carpenters will be offset by expected productivity gains resulting from the increasing use of prefabricated components, such as prehung doors and windows and prefabricated wall panels and stairs, which can be installed very quickly. Prefabricated walls, partitions, and stairs are lifted into place in one operation; beams—and, in some cases, entire roof assemblies—are lifted into place using a crane. As prefabricated components become more standardized, builders will use them more often. In addition, improved adhesives will reduce the time needed to join materials, and lightweight, cordless, and pneumatic tools—such as nailers and drills—all make carpenters more efficient.

Carpenters can experience periods of unemployment because of the short-term nature of many construction projects and the cyclical nature of the construction industry. Building activity depends on many factors—interest rates, availability of mortgage funds, the season, government spending, and business investment—that vary with the state of the economy. During economic downturns, the number of job openings for carpenters declines. New and improved tools, equipment, techniques, and materials have vastly increased carpenter versatility. Therefore, carpenters with all-round skills will have better opportunities for steady work than carpenters who can do only a few relatively simple, routine tasks.

Job opportunities for carpenters also vary by geographic area. Construction activity parallels the movement of people and businesses and reflects differences in local economic conditions. Therefore, the number of job opportunities and apprenticeship opportunities in a given year may vary widely from area to area.

Earnings

In 2002, median hourly earnings of carpenters were \$16.44. The middle 50 percent earned between \$12.59 and \$21.91. The lowest 10 percent earned less than \$9.95, and the highest 10 percent earned more than \$27.97. Median hourly earnings in the industries employing the largest numbers of carpenters in 2002 are shown below:

Nonresidential building construction	\$18.31
Building finishing contractors	17.30
Residential building construction	16.02
Foundation, structure, and building exterior contractors	16.01
Employment services	12.58

Earnings can be reduced on occasion, because carpenters lose work time in bad weather and during recessions when jobs are unavailable.

Some carpenters are members of the United Brotherhood of Carpenters and Joiners of America.

Sources of Additional Information

For information about carpentry apprenticeships or other work opportunities in this trade, contact local carpentry contractors, locals of the union mentioned above, local

joint union-contractor apprenticeship committees, or the nearest office of the State employment service or apprenticeship agency.

- Associated Builders and Contractors, Workforce Development Department, 4250 North Fairfax Dr., 9th Floor, Arlington, VA 22203.
- Associated General Contractors of America, Inc., 333 John Carlyle St., Suite 200, Alexandria VA, 22314. Internet: <http://www.agc.org>
- Home Builders Institute, 1201 15th St. NW., Washington, DC 20005. Internet: <http://www.hbi.org>
- National Association of Home Builders, 1201 15th St. NW., Washington, DC 20005. Internet: <http://www.nahb.org>
- United Brotherhood of Carpenters and Joiners of America, 50 F St. NW., Washington, DC 20001. Internet: <http://www.carpenters.org>

There are more than 500 occupations registered by the U.S. Department of Labor's National Apprenticeship system. For more information on the Labor Department's registered apprenticeship system and links to State apprenticeship programs, check the Web site: <http://www.doleta.gov>

Welders

[Back to Menu](#)

Significant Points

- Job prospects should be excellent.
- Training ranges from a few weeks of school or on-the-job training for low-skilled positions to several years of combined school and on-the-job training for highly skilled jobs.

Nature of the Work

Welding is the most common way of permanently joining metal parts. In this process, heat is applied to metal pieces, melting and fusing them to form a permanent bond. Because of its strength, welding is used in shipbuilding, automobile manufacturing and repair, aerospace applications, and thousands of other manufacturing activities. Welding also is used to join beams when constructing buildings, bridges, and other structures, and to join pipes in pipelines, power plants, and refineries.

Welders use many types of welding equipment set up in a variety of positions, such as flat, vertical, horizontal, and overhead. They may perform manual welding, in which the work is entirely controlled by the welder, or semiautomatic welding, in which the welder uses machinery, such as a wire feeder, to perform welding tasks.

Arc welding is the most common type of welding. Standard arc welding involves two large metal alligator clips that carry a strong electrical current. One clip is attached to any part of the work piece being welded. The second clip is connected to a thin welding rod. When the rod touches the work piece, a powerful electrical circuit is created. The massive heat created by the electrical current causes both the work piece and the steel core of the rod to melt together, cooling quickly to form a solid

bond. During welding, the flux that surrounds the rod's core vaporizes, forming an inert gas that serves to protect the weld from atmospheric elements that might weaken it. Welding speed is important. Variations in speed can change the amount of flux applied, weakening the weld, or weakening the surrounding metal by increasing heat exposure.

Two common but advanced types of welding are Gas Tungsten Arc (TIG) and Gas Metal Arc (MIG) welding. TIG welding often is used with stainless steel or aluminum. While TIG uses welding rods, MIG uses a spool of continuously fed wire, which allows the welder to join longer stretches of metal without stopping to replace the rod. In TIG welding, the welder holds the welding rod in one hand and an electric torch in the other hand. The torch is used to simultaneously melt the rod and the work piece. In MIG welding, the welder holds the wire feeder, which functions like the alligator clip in arc welding. Instead of using gas flux surrounding the rod, TIG and MIG protect the initial weld from the environment by blowing inert gas onto the weld.

Like arc welding, soldering and brazing use molten metal to join two pieces of metal. However, the metal added during the process has a melting point lower than that of the work piece, so only the added metal is melted, not the work piece. Soldering uses metals with a melting point below 800 degrees Fahrenheit; brazing uses metals with a higher melting point. Because soldering and brazing do not melt the work piece, these processes normally do not create the distortions or weaknesses in the work piece that can occur with welding. Soldering commonly is used to join electrical, electronic, and other small metal parts. Brazing produces a stronger joint than does soldering, and often is used to join metals other than steel, such as brass. Brazing can also be used to apply coatings to parts to reduce wear and protect against corrosion.

Skilled welding, soldering, and brazing workers generally plan work from drawings or specifications or use their knowledge of fluxes and base metals to analyze the parts to be joined. These workers then select and set up welding equipment, execute the planned welds, and examine welds to ensure that they meet standards or specifications. Highly skilled welders often are trained to work with a wide variety of materials in addition to steel, such as titanium, aluminum, or plastics. Some welders have more limited duties, however. They perform routine jobs that already have been planned and laid out and do not require extensive knowledge of welding techniques.

Automated welding is used in an increasing number of production processes. In these instances, a machine or robot performs the welding tasks while monitored by a welding machine operator. Welding, soldering, and brazing machine setters, operators, and tenders follow specified layouts, work orders, or blueprints. Operators must load parts correctly and constantly monitor the machine to ensure that it produces the desired bond.

The work of arc, plasma, and oxy-gas cutters is closely related to that of welders. However, instead of joining metals, cutters use the heat from an electric arc, a stream of ionized gas (plasma), or burning gases to cut and trim metal objects to specific dimensions. Cutters also dismantle large objects, such as ships, railroad cars, automobiles, buildings, or aircraft. Some operate and monitor cutting machines similar to those used by welding machine operators. Plasma cutting has been

increasing in popularity because, unlike other methods, it can cut a wide variety of metals, including stainless steel, aluminum, and titanium.

Working Conditions

Welding, soldering, and brazing workers often are exposed to a number of hazards, including the intense light created by the arc, poisonous fumes, and very hot materials. They wear safety shoes, goggles, hoods with protective lenses, and other devices designed to prevent burns and eye injuries and to protect them from falling objects. They normally work in well-ventilated areas to limit their exposure to fumes. Automated welding, soldering, and brazing machine operators are not exposed to as many dangers, however, and a face shield or goggles usually provide adequate protection for these workers.

Welders and cutters may work outdoors, often in inclement weather, or indoors, sometimes in a confined area designed to contain sparks and glare. Outdoors, they may work on a scaffold or platform high off the ground. In addition, they may be required to lift heavy objects and work in a variety of awkward positions, while bending, stooping, or standing to perform work overhead.

Although about 55 percent of welders, solderers, and brazers work a 40-hour week, overtime is common, and some welders work up to 70 hours per week. Welders also may work in shifts as long as 12 hours. Some welders, solderers, brazers, and machine operators work in factories that operate around the clock, necessitating shift work.

Employment

Welding, soldering, and brazing workers held about 452,000 jobs in 2002. Of these jobs, about 2 of every 3 were found in manufacturing. Jobs were concentrated in transportation equipment manufacturing (motor vehicle body and parts and ship and boat building), machinery manufacturing (agriculture, construction, and mining machinery), and architectural and structural metals manufacturing. Most jobs for welding, soldering, and brazing machine setters, operators, and tenders were found in the same manufacturing industries as skilled welding, soldering, and brazing workers.

Training, Other Qualifications, and Advancement

Training for welding, soldering, and brazing workers can range from a few weeks of school or on-the-job training for low-skilled positions to several years of combined school and on-the-job training for highly skilled jobs. Formal training is available in high schools, vocational schools, and postsecondary institutions, such as vocational-technical institutes, community colleges, and private welding schools. The Armed Forces operate welding schools as well. Some employers provide training. Courses in blueprint reading, shop mathematics, mechanical drawing, physics, chemistry, and metallurgy are helpful. Knowledge of computers is gaining importance, especially for welding, soldering, and brazing machine operators, who are becoming responsible for the programming of computer-controlled machines, including robots.

Some welders become certified, a process whereby the employer sends a worker to an institution, such as an independent testing lab or technical school, to weld a test specimen according to specific codes and standards required by the employer. Testing procedures are based on the standards and codes set by one of several industry associations with which the employer may be affiliated. If the welding inspector at the examining institution determines that the worker has performed according to the employer's guidelines, the inspector will then certify the welder being tested as able to work with a particular welding procedure.

Welding, soldering, and brazing workers need good eyesight, hand-eye coordination, and manual dexterity. They should be able to concentrate on detailed work for long periods and be able to bend, stoop, and work in awkward positions. In addition, welders increasingly need to be willing to receive training and perform tasks in other production jobs.

Welders can advance to more skilled welding jobs with additional training and experience. For example, they may become welding technicians, supervisors, inspectors, or instructors. Some experienced welders open their own repair shops.

Job Outlook

Job prospects should be excellent, as many potential entrants who could be welders may prefer to attend college or may prefer work that has more comfortable working conditions. Employment of welding, soldering, and brazing workers is expected to grow about as fast as the average for all occupations over the 2002-12 period. In addition, many openings will arise as workers retire or leave the occupation for other reasons.

The major factor affecting employment of welders is the health of the industries in which they work. Because almost every manufacturing industry uses welding at some stage of manufacturing or in the repair and maintenance of equipment, a strong economy will keep demand for welders high. A downturn affecting industries such as auto manufacturing, construction, or petroleum, however, would have a negative impact on the employment of welders in those areas, and could cause some layoffs. Levels of government funding for shipbuilding as well as for infrastructure repairs and improvements are expected to be another important determinant of the future number of welding jobs.

Regardless of the state of the economy, the pressures to improve productivity and hold down labor costs are leading many companies to invest more in automation, especially computer-controlled and robotically-controlled welding machinery. This will reduce the demand for some low-skilled welders, solderers, and brazers because these simple, repetitive jobs are being automated. The growing use of automation, however, should increase demand for welding, soldering, and brazing machine setters, operators, and tenders. Welders working on construction projects or in equipment repair will not be affected by technology change to the same extent, because their jobs are not as easily automated.

Technology is helping to improve welding, creating more uses for welding in the workplace and expanding employment opportunities. For example, new ways are being developed to bond dissimilar materials and nonmetallic materials, such as plastics, composites, and new alloys. In addition, laser beam and electron beam

welding, new fluxes, and other new technologies and techniques are improving the results of welding, making it useful in a wider assortment of applications. Improvements in technology have also boosted welding productivity, making welding more competitive with other methods of joining materials.

Earnings

Median hourly earnings of welders, cutters, solderers, and brazers were \$14.02 in 2002. The middle 50 percent earned between \$11.41 and \$17.34. The lowest 10 percent had earnings of less than \$9.41, while the top 10 percent earned over \$21.79. The range of earnings of welders reflects the wide range of skill levels. Median hourly earnings in the industries employing the largest numbers of welders, cutters, solderers, and brazers in 2002 were:

Motor vehicle parts manufacturing	\$16.02
Agriculture, construction, and mining machinery manufacturing	13.74
Architectural and structural metals manufacturing	13.34
Commercial and industrial machinery and equipment (except automotive and electronic) repair and maintenance	13.06
Motor vehicle body and trailer manufacturing	12.83

Median hourly earnings of welding, soldering, and brazing machine setters, operators, and tenders were \$13.90 in 2002. The middle 50 percent earned between \$11.22 and \$17.77. The lowest 10 percent had earnings of less than \$9.36, while the top 10 percent earned over \$24.60. Median hourly earnings in motor vehicle parts manufacturing, the industry employing the largest numbers of welding machine operators in 2002 were \$18.29.

Many welders belong to unions. Among these are the International Association of Machinists and Aerospace Workers; the International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the United Association of Journeymen and Apprentices of the Plumbing, Pipefitting, Sprinkler Fitting Industry of the United States and Canada; and the United Electrical, Radio, and Machine Workers of America.

Sources of Additional Information

For information on training opportunities and jobs for welding, soldering, and brazing workers, contact local employers, the local office of the state employment service, or schools providing welding, soldering, or brazing training.

- American Welding Society, 550 N.W. Lejeune Rd., Miami, FL 33126-5699.
Internet: <http://www.aws.org>

Significant Points

- Job opportunities are expected to be good.
- Most electricians acquire their skills by completing an apprenticeship program lasting 3 to 5 years.
- More than one-quarter of wage and salaried electricians work in industries other than construction.

Nature of Work

Electricity is essential for light, power, air-conditioning, and refrigeration. Electricians install, connect, test, and maintain electrical systems for a variety of purposes, including climate control, security, and communications. They also may install and maintain the electronic controls for machines in business and industry. Although most electricians specialize in construction or maintenance, a growing number do both.

Electricians work with blueprints when they install electrical systems in factories, office buildings, homes, and other structures. Blueprints indicate the locations of circuits, outlets, load centers, panel boards, and other equipment. Electricians must follow the National Electric Code and comply with State and local building codes when they install these systems. In factories and offices, they first place conduit (pipe or tubing) inside designated partitions, walls, or other concealed areas. They also fasten to the walls small metal or plastic boxes that will house electrical switches and outlets. They then pull insulated wires or cables through the conduit to complete circuits between these boxes. In lighter construction, such as residential, plastic-covered wire usually is used instead of conduit.

Regardless of the type of wire used, electricians connect it to circuit breakers, transformers, or other components. They join the wires in boxes with various specially designed connectors. After they finish the wiring, they use testing equipment, such as ohmmeters, voltmeters, and oscilloscopes, to check the circuits for proper connections, ensuring electrical compatibility and safety of components.

Electricians also may install low voltage wiring systems in addition to wiring a building's electrical system. Low voltage wiring involves voice, data, and video wiring systems, such as those for telephones, computers and related equipment, intercoms, and fire alarm and security systems. Electricians also may install coaxial or fiber optic cable for computers and other telecommunications equipment and electronic controls for industrial equipment.

Maintenance work varies greatly, depending on where the electrician is employed. Electricians who specialize in residential work may rewire a home and replace an old fuse box with a new circuit breaker box to accommodate additional appliances. Those who work in large factories may repair motors, transformers, generators, and electronic controllers on machine tools and industrial robots. Those in office buildings and small plants may repair all types of electrical equipment.

Maintenance electricians spend much of their time doing preventive maintenance. They periodically inspect equipment, and locate and correct problems before breakdowns occur. Electricians may also advise management whether continued operation of equipment could be hazardous. When needed, they install new electrical equipment. When breakdowns occur, they must make the necessary repairs as quickly as possible in order to minimize inconvenience. Electricians may replace items such as circuit breakers, fuses, switches, electrical and electronic components, or wire. When working with complex electronic devices, they may work with engineers, engineering technicians, or industrial machinery installation, repair, and maintenance workers.

Electricians use hand tools such as screwdrivers, pliers, knives, hacksaws, and wire strippers. They also use a variety of power tools as well as testing equipment such as oscilloscopes, ammeters, and test lamps.

Working Conditions

Electricians' work is sometimes strenuous. They bend conduit, stand for long periods, and frequently work on ladders and scaffolds. Their working environment varies, depending on the type of job. Some may work in dusty, dirty, hot, or wet conditions, or in confined areas, ditches, or other uncomfortable places. Electricians risk injury from electrical shock, falls, and cuts; to avoid injuries, they must follow strict safety procedures. Some electricians may have to travel great distances to jobsites.

Most electricians work a standard 40-hour week, although overtime may be required. Those in maintenance work may work nights or weekends, and be on call. Maintenance electricians may also have periodic extended overtime during scheduled maintenance or retooling periods. Companies that operate 24 hours a day may employ three shifts of electricians.

Employment

Electricians held about 659,000 jobs in 2002. More than one-quarter of wage and salary workers were employed in the construction industry; while the remainder worked as maintenance electricians employed outside the construction industry. In addition, about one in ten electricians were self-employed.

Because of the widespread need for electrical services, jobs for electricians are found in all parts of the country.

Training, Other Qualifications, and Advancement

Most people learn the electrical trade by completing an apprenticeship program lasting 3 to 5 years. Apprenticeship gives trainees a thorough knowledge of all aspects of the trade and generally improves their ability to find a job. Although electricians are more likely to be trained through apprenticeship than are workers in other construction trades, some still learn their skills informally on the job. Others train to be residential electricians in a 3-year program.

Apprenticeship programs may be sponsored by joint training committees made up of local unions of the International Brotherhood of Electrical Workers and local chapters

of the National Electrical Contractors Association; company management committees of individual electrical contracting companies; or local chapters of the Associated Builders and Contractors and the Independent Electrical Contractors Association. Because of the comprehensive training received, those who complete apprenticeship programs qualify to do both maintenance and construction work.

The typical large apprenticeship program provides at least 144 hours of classroom instruction and 2,000 hours of on-the-job training each year. In the classroom, apprentices learn blueprint reading, electrical theory, electronics, mathematics, electrical code requirements, and safety and first aid practices. They also may receive specialized training in welding, communications, fire alarm systems, and cranes and elevators. On the job, under the supervision of experienced electricians, apprentices must demonstrate mastery of the electrician's work. At first, they drill holes, set anchors, and set up conduit. Later, they measure, fabricate, and install conduit, as well as install, connect, and test wiring, outlets, and switches. They also learn to set up and draw diagrams for entire electrical systems.

After finishing an apprenticeship, journeymen often continue to learn about related electrical systems, such as low voltage voice, data, and video systems. Many builders and owners want to work with only one contractor who can install or repair both regular electrical systems and low voltage systems.

Those who do not enter a formal apprenticeship program can begin to learn the trade informally by working as helpers for experienced electricians. While learning to install conduit, connect wires, and test circuits, helpers also learn safety practices. Many helpers supplement this training with trade school or correspondence courses.

Regardless of how one learns the trade, previous training is very helpful. High school courses in mathematics, electricity, electronics, mechanical drawing, science, and shop provide a good background. Special training offered in the U.S. Armed Forces and by postsecondary technical schools also is beneficial. All applicants should be in good health and have at least average physical strength. Agility and dexterity also are important. Good color vision is needed because workers frequently must identify electrical wires by color.

Most apprenticeship sponsors require applicants for apprentice positions to be at least 18 years old, have a high school diploma or its equivalent, and be able to pass a skills test. For those interested in becoming maintenance electricians, a background in electronics is increasingly important because of the growing use of complex electronic controls on manufacturing equipment.

Most localities require electricians to be licensed. Although licensing requirements vary from area to area, electricians usually must pass an examination that tests their knowledge of electrical theory, the National Electrical Code, and local electric and building codes. Electricians periodically take courses offered by their employer or union to keep abreast of changes in the National Electrical Code, materials, or methods of installation.

Experienced electricians can become supervisors and then superintendents. Those with sufficient capital and management skills may start their own contracting business, although this may require an electrical contractor's license. Many electricians become electrical inspectors.

Job Outlook

Job opportunities for electricians are expected to be good. Numerous openings will arise each year as experienced electricians leave the occupation. In addition, many potential workers may choose not to enter training programs because they prefer work that is less strenuous and has more comfortable working conditions.

Employment of electricians is expected to grow faster than the average for all occupations through the year 2012. As the population and economy grow, more electricians will be needed to install and maintain electrical devices and wiring in homes, factories, offices, and other structures. New technologies also are expected to continue to stimulate the demand for these workers. For example, buildings will be prewired during construction to accommodate use of computers and telecommunications equipment. More factories will be using robots and automated manufacturing systems. Additional jobs will be created by rehabilitation and retrofitting of existing structures.

In addition to jobs created by increased demand for electrical work, many openings will occur each year as electricians transfer to other occupations, retire, or leave the labor force for other reasons. Because the training for this occupation is long and difficult and the earnings are relatively high, a smaller proportion of electricians than of other craftworkers leave the occupation each year. The number of retirements is expected to rise, however, as more electricians reach retirement age.

Employment of construction electricians, like that of many other construction workers, is sensitive to changes in the economy. This results from the limited duration of construction projects and the cyclical nature of the construction industry. During economic downturns, job openings for electricians are reduced as the level of construction activity declines. Apprenticeship opportunities also are less plentiful during these periods.

Although employment of maintenance electricians is steadier than that of construction electricians, those working in the automotive and other manufacturing industries that are sensitive to cyclical swings in the economy may be laid off during recessions. Also, efforts to reduce operating costs and increase productivity through the increased use of contracting out for electrical services may limit opportunities for maintenance electricians in many industries. However, this should be partially offset by increased job opportunities for electricians in electrical contracting firms.

Job opportunities for electricians also vary by area. Employment opportunities follow the movement of people and businesses among States and local areas, and reflect differences in local economic conditions. The number of job opportunities in a given year may fluctuate widely from area to area.

Earnings

In 2002, median hourly earnings of electricians were \$19.90. The middle 50 percent earned between \$14.95 and \$26.50. The lowest 10 percent earned less than \$11.81, and the highest 10 percent earned more than \$33.21. Median hourly earnings in the industries employing the largest numbers of electricians in 2002 are shown below:

Motor vehicle parts manufacturing	\$28.72
Local government	21.15
Building equipment contractors	19.54
Nonresidential building construction	19.36
Employment services	15.46

Depending on experience, apprentices usually start at between 40 and 50 percent of the rate paid to fully trained electricians. As apprentices become more skilled, they receive periodic increases throughout the course of their training. Many employers also provide training opportunities for experienced electricians to improve their skills.

Many construction electricians are members of the International Brotherhood of Electrical Workers. Among unions organizing maintenance electricians are the International Brotherhood of Electrical Workers; the International Union of Electronic, Electrical, Salaried, Machine, and Furniture Workers; the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aircraft and Agricultural Implement Workers of America; and the United Steelworkers of America.

Sources of Additional Information

For details about apprenticeships or other work opportunities in this trade, contact the offices of the State employment service, the State apprenticeship agency, local electrical contractors or firms that employ maintenance electricians, or local union-management electrician apprenticeship committees. This information also may be available from local chapters of the Independent Electrical Contractors, Inc.; the National Electrical Contractors Association; the Home Builders Institute; the Associated Builders and Contractors; and the International Brotherhood of Electrical Workers.

- National Joint Apprenticeship Training Committee (NJATC), 301 Prince George's Blvd., Upper Marlboro, MD 20774. Internet: <http://www.njatc.org>
- National Electrical Contractors Association (NECA), 3 Metro Center, Suite 1100, Bethesda, MD 20814. Internet: <http://www.necanet.org>
- International Brotherhood of Electrical Workers (IBEW), 1125 15th St. NW., Washington, DC 20005. Internet: <http://www.ibew.org>
- Associated Builders and Contractors, Workforce Development Department, 4250 North Fairfax Dr., 9th Floor, Arlington, VA 22203.
- Independent Electrical Contractors, Inc., 4401 Ford Ave., Suite 1100, Alexandria, VA 22302. Internet: <http://www.ieci.org>
- National Association of Home Builders, 1201 15th St. NW., Washington, DC 20005. Internet: <http://www.nahb.org>
- Home Builders Institute, 1201 15th St. NW., Washington, DC 20005. Internet: <http://www.hbi.org>

There are more than 500 occupations registered by the U.S. Department of Labor's National Apprenticeship system. For more information on the Labor Department's registered apprenticeship system and links to State apprenticeship programs, check their Web site: <http://www.doleta.gov>.

Significant Points

- Firefighting involves hazardous conditions and long, irregular hours.
- About 9 out of 10 firefighting workers were employed by municipal or county fire departments.
- Applicants for municipal firefighting jobs generally must pass written, physical, and medical examinations.
- Keen competition for jobs is expected.

Nature of the Work

Every year, fires and other emergencies take thousands of lives and destroy property worth billions of dollars. Firefighters help protect the public against these dangers by rapidly responding to a variety of emergencies. They are frequently the first emergency personnel at the scene of a traffic accident or medical emergency and may be called upon to put out a fire, treat injuries, or perform other vital functions.

During duty hours, firefighters must be prepared to respond immediately to a fire or any other emergency that arises. Because fighting fires is dangerous and complex, it requires organization and teamwork. At every emergency scene, firefighters perform specific duties assigned by a superior officer. At fires, they connect hose lines to hydrants, operate a pump to send water to high pressure hoses, and position ladders to enable them to deliver water to the fire. They also rescue victims and provide emergency medical attention as needed, ventilate smoke-filled areas, and attempt to salvage the contents of buildings. Their duties may change several times while the company is in action. Sometimes they remain at the site of a disaster for days at a time, rescuing trapped survivors and assisting with medical treatment.

Firefighters have assumed a range of responsibilities, including emergency medical services. In fact, most calls to which firefighters respond involve medical emergencies, and about half of all fire departments provide ambulance service for victims. Firefighters receive training in emergency medical procedures, and many fire departments require them to be certified as emergency medical technicians.

Firefighters work in a variety of settings, including urban and suburban areas, airports, chemical plants, other industrial sites, and rural areas like grasslands and forests. In addition, some firefighters work in hazardous materials units that are trained for the control, prevention, and cleanup of oil spills and other hazardous materials incidents. Workers in urban and suburban areas, airports, and industrial sites typically use conventional firefighting equipment and tactics, while forest fires and major hazardous materials spills call for different methods.

In national forests and parks, **forest fire inspectors and prevention specialists** spot fires from watchtowers and report their findings to headquarters by telephone or radio. Forest rangers patrol to ensure travelers and campers comply with fire regulations. When fires break out, crews of firefighters are brought in to suppress the blaze using heavy equipment, hand tools, and water hoses. Forest firefighting, like urban firefighting, can be rigorous work. One of the most effective means of

battling the blaze is by creating fire lines through cutting down trees and digging out grass and all other combustible vegetation, creating bare land in the path of the fire that deprives it of fuel. Elite firefighters, called smoke jumpers, parachute from airplanes to reach otherwise inaccessible areas. This can be extremely hazardous because the crews have no way to escape if the wind shifts and causes the fire to burn toward them.

Between alarms, firefighters clean and maintain equipment, conduct practice drills and fire inspections, and participate in physical fitness activities. They also prepare written reports on fire incidents and review fire science literature to keep abreast of technological developments and changing administrative practices and policies.

Most fire departments have a fire prevention division, usually headed by a fire marshal and staffed by **fire inspectors**. Workers in this division conduct inspections of structures to prevent fires and ensure fire code compliance. These firefighters also work with developers and planners to check and approve plans for new buildings. Fire prevention personnel often speak on these subjects in schools and before public assemblies and civic organizations.

Some firefighters become **fire investigators**, who determine the origin and causes of fires. They collect evidence, interview witnesses, and prepare reports on fires in cases where the cause may be arson or criminal negligence. They often are called upon to testify in court.

Working Conditions

Firefighters spend much of their time at fire stations, which usually have features common to a residential facility like a dormitory. When an alarm sounds, firefighters respond rapidly, regardless of the weather or hour. Firefighting involves risk of death or injury from sudden cave-ins of floors, toppling walls, traffic accidents when responding to calls, and exposure to flames and smoke. Firefighters may also come in contact with poisonous, flammable, or explosive gases and chemicals, as well as radioactive or other hazardous materials that may have immediate or long-term effects on their health. For these reasons, they must wear protective gear that can be very heavy and hot.

Work hours of firefighters are longer and vary more widely than hours of most other workers. Many work more than 50 hours a week, and sometimes they may work even longer. In some agencies, they are on duty for 24 hours, then off for 48 hours, and receive an extra day off at intervals. In others, they work a day shift of 10 hours for 3 or 4 days, a night shift of 14 hours for 3 or 4 nights, have 3 or 4 days off, and then repeat the cycle. In addition, firefighters often work extra hours at fires and other emergencies and are regularly assigned to work on holidays. Fire lieutenants and fire captains often work the same hours as the firefighters they supervise. Duty hours include time when firefighters study, train, and perform fire prevention duties.

Employment

Employment figures include only paid career firefighters—they do not cover volunteer firefighters, who perform the same duties and may comprise the majority of firefighters in a residential area. According to the United States Fire Administration, nearly 70 percent of fire companies are staffed by volunteer fire fighters. Paid career

firefighters held about 282,000 jobs in 2002. First-line supervisors/managers of firefighting and prevention workers held about 63,000 jobs; and fire inspectors held about 14,000.

About 9 out of 10 firefighting workers were employed by municipal or county fire departments. Some large cities have thousands of career firefighters, while many small towns have only a few. Most of the remainder worked in fire departments on Federal and State installations, including airports. Private firefighting companies employ a small number of firefighters and usually operate on a subscription basis.

In response to the expanding role of firefighters, some municipalities have combined fire prevention, public fire education, safety, and emergency medical services into a single organization commonly referred to as a public safety organization. Some local and regional fire departments are being consolidated into countywide establishments in order to reduce administrative staffs and cut costs, and to establish consistent training standards and work procedures.

Applicants for municipal firefighting jobs generally must pass a written exam; tests of strength, physical stamina, coordination, and agility; and a medical examination that includes drug screening. Workers may be monitored on a random basis for drug use after accepting employment. Examinations are generally open to persons who are at least 18 years of age and have a high school education or the equivalent. Those who receive the highest scores in all phases of testing have the best chances for appointment. The completion of community college courses in fire science may improve an applicant's chances for appointment. In recent years, an increasing proportion of entrants to this occupation have had some postsecondary education.

As a rule, entry-level workers in large fire departments are trained for several weeks at the department's training center or academy. Through classroom instruction and practical training, the recruits study firefighting techniques, fire prevention, hazardous materials control, local building codes, and emergency medical procedures, including first aid and cardiopulmonary resuscitation. They also learn how to use axes, chain saws, fire extinguishers, ladders, and other firefighting and rescue equipment. After successfully completing this training, they are assigned to a fire company, where they undergo a period of probation.

A number of fire departments have accredited apprenticeship programs lasting up to 5 years. These programs combine formal, technical instruction with on-the-job training under the supervision of experienced firefighters. Technical instruction covers subjects such as firefighting techniques and equipment, chemical hazards associated with various combustible building materials, emergency medical procedures, and fire prevention and safety. Fire departments frequently conduct training programs, and some firefighters attend training sessions sponsored by the U.S. National Fire Academy. These training sessions cover topics including executive development, anti-arson techniques, disaster preparedness, hazardous materials control, and public fire safety and education. Some States also have extensive firefighter training and certification programs. In addition, a number of colleges and universities offer courses leading to 2- or 4-year degrees in fire engineering or fire science. Many fire departments offer firefighters incentives such as tuition reimbursement or higher pay for completing advanced training.

Among the personal qualities firefighters need are mental alertness, self-discipline, courage, mechanical aptitude, endurance, strength, and a sense of public service. Initiative and good judgment are also extremely important because firefighters make quick decisions in emergencies. Because members of a crew live and work closely together under conditions of stress and danger for extended periods, they must be dependable and able to get along well with others. Leadership qualities are necessary for officers, who must establish and maintain discipline and efficiency, as well as direct the activities of firefighters in their companies.

Most experienced firefighters continue studying to improve their job performance and prepare for promotion examinations. To progress to higher level positions, they acquire expertise in advanced firefighting equipment and techniques, building construction, emergency medical technology, writing, public speaking, management and budgeting procedures, and public relations.

Opportunities for promotion depend upon written examination results, job performance, interviews, and seniority. Increasingly, fire departments use assessment centers, which simulate a variety of actual job performance tasks, to screen for the best candidates for promotion. The line of promotion usually is to engineer, lieutenant, captain, battalion chief, assistant chief, deputy chief, and finally to chief. Many fire departments now require a bachelor's degree, preferably in fire science, public administration, or a related field, for promotion to positions higher than battalion chief. A master's degree is required for executive fire officer certification from the National Fire Academy and for State chief officer certification.

Job Outlook

Prospective firefighters are expected to face keen competition for available job openings. Many people are attracted to firefighting because it is challenging and provides the opportunity to perform an essential public service, a high school education is usually sufficient for entry, and a pension is guaranteed upon retirement after 20 years. Consequently, the number of qualified applicants in most areas exceeds the number of job openings, even though the written examination and physical requirements eliminate many applicants. This situation is expected to persist in coming years.

Employment of firefighters is expected to grow about as fast as the average for all occupations through 2012 as fire departments continue to compete with other public safety providers for funding. Most job growth will occur as volunteer firefighting positions are converted to paid positions. In addition to job growth, openings are expected to result from the need to replace firefighters who retire, stop working for other reasons, or transfer to other occupations.

Layoffs of firefighters are uncommon. Fire protection is an essential service, and citizens are likely to exert considerable pressure on local officials to expand or at least preserve the level of fire protection. Even when budget cuts do occur, local fire departments usually cut expenses by postponing equipment purchases or not hiring new firefighters, rather than through staff reductions.

Earnings

Median hourly earnings of firefighters were \$17.42 in 2002. The middle 50 percent earned between \$12.53 and \$22.96. The lowest 10 percent earned less than \$8.51, and the highest 10 percent earned more than \$28.22. Median hourly earnings were \$17.92 in local government, \$15.96 in the Federal Government, and \$13.58 in State government.

Median annual earnings of first-line supervisors/managers of firefighting and prevention workers were \$55,450 in 2002. The middle 50 percent earned between \$43,920 and \$68,480. The lowest 10 percent earned less than \$34,190, and the highest 10 percent earned more than \$84,730. First-line supervisors/managers of firefighting and prevention workers employed in local government earned about \$56,390 a year in 2002.

Median annual earnings of fire inspectors were \$44,250 in 2002. The middle 50 percent earned between \$33,880 and \$56,100 a year. The lowest 10 percent earned less than \$26,350, and the highest 10 percent earned more than \$69,060. Fire inspectors and investigators employed in local government earned about \$46,820 a year.

According to the International City-County Management Association, average salaries in 2002 for sworn full-time positions were as follows:

	Minimum annual base salary	Maximum annual base salary
Fire chief	\$64,134	\$82,225
Deputy chief	56,522	72,152
Assistant fire chief	55,645	69,036
Battalion chief	54,935	68,673
Fire captain	45,383	54,463
Fire lieutenant	41,800	49,404
Fire prevention/code inspector	40,387	51,531
Engineer	38,656	48,678

Firefighters who average more than a certain number of hours a week are required to be paid overtime. The hours threshold is determined by the department during the firefighter's work period, which ranges from 7 to 28 days. Firefighters often earn overtime for working extra shifts to maintain minimum staffing levels or for special emergencies.

Firefighters receive benefits that usually include medical and liability insurance, vacation and sick leave, and some paid holidays. Almost all fire departments provide protective clothing (helmets, boots, and coats) and breathing apparatus, and many also provide dress uniforms. Firefighters are generally covered by pension plans, often providing retirement at half pay after 25 years of service or if disabled in the line of duty.

Sources of Additional Information

Information about a career as a firefighter may be obtained from local fire departments and from:

- International Association of Firefighters, 1750 New York Ave. NW., Washington, DC 20006. Internet: <http://www.iaff.org>
- U.S. Fire Administration, 16825 South Seton Ave., Emmitsburg, MD 21727. Internet: <http://www.usfa.fema.gov>
- National Fire Academy, 16825 South Seton Ave., Emmitsburg, MD 21727. Internet: <http://www.usfa.fema.gov/nfa/index.htm>

Food Service Managers

[Back to Menu](#)

Significant Points

- Many experienced food and beverage preparation and service workers are promoted into managerial positions; however, applicants with a bachelor's or an associate degree in restaurant and institutional food service management should have the best job opportunities.
- Most new jobs will arise in food services and drinking places as the number of establishments increases along with the population.
- Job opportunities for salaried food service managers should be better than for self-employed managers, because more restaurant managers will be employed by larger companies to run multi-outlet establishments.

Nature of the Work

Food service managers are responsible for the daily operations of restaurants and other establishments that prepare and serve meals and beverages to customers. Besides coordinating activities among various departments, such as kitchen, dining room, and banquet operations, food service managers ensure that customers are satisfied with their dining experience. In addition, they oversee the inventory and ordering of food, equipment, and supplies and arrange for the routine maintenance and upkeep of the restaurant, its equipment, and facilities. Managers generally are responsible for all of the administrative and human-resource functions of running the business, including recruiting new employees and monitoring employee performance and training.

In most full-service restaurants and institutional food service facilities, the management team consists of a *general manager*, one or more *assistant managers*, and an *executive chef*. The executive chef is responsible for all food preparation activities, including running kitchen operations, planning menus, and maintaining quality standards for food service. In limited-service eating places, such as sandwich shops, coffee bars, or fast-food establishments, managers, not executive chefs, are responsible for supervising routine food preparation operations. Assistant managers in full-service facilities generally oversee service in the dining rooms and banquet areas. In larger restaurants and fast-food or other food service facilities that serve meals daily and maintain longer hours, individual assistant managers may supervise

different shifts of workers. In smaller restaurants, formal titles may be less important, and one person may undertake the work of one or more food service positions. For example, the executive chef also may be the general manager or even sometimes an owner.

One of the most important tasks of food service managers is assisting executive chefs as they select successful menu items. This task varies by establishment depending on the seasonality of menu items, the frequency with which restaurants change their menus, and the introduction of daily or weekly specials. Many restaurants rarely change their menus while others make frequent alterations. Managers or executive chefs select menu items, taking into account the likely number of customers and the past popularity of dishes. Other issues considered when planning a menu include whether there was any unserved food left over from prior meals that should not be wasted, the need for variety, and the seasonal availability of foods. Managers or executive chefs analyze the recipes of the dishes to determine food, labor, and overhead costs and to assign prices to various dishes. Menus must be developed far enough in advance, that supplies can be ordered and received in time.

Managers or executive chefs estimate food needs, place orders with distributors, and schedule the delivery of fresh food and supplies. They plan for routine services or deliveries, such as linen services or the heavy cleaning of dining rooms or kitchen equipment, to occur during slow times or when the dining room is closed. Managers also arrange for equipment maintenance and repairs, and coordinate a variety of services such as waste removal and pest control. Managers or executive chefs receive deliveries and check the contents against order records. They inspect the quality of fresh meats, poultry, fish, fruits, vegetables, and baked goods to ensure that expectations are met. They meet with representatives from restaurant supply companies and place orders to replenish stocks of tableware, linens, paper products, cleaning supplies, cooking utensils, and furniture and fixtures.

Managers must be good communicators. They need to speak well, often in several languages, with a diverse clientele and staff. They must motivate employees to work as a team, to ensure that food and service meet appropriate standards. Managers also must ensure that written supply orders are clear and unambiguous.

Managers interview, hire, train, and, when necessary, fire employees. Retaining good employees is a major challenge facing food service managers. Managers recruit employees at career fairs, contact schools that offer academic programs in hospitality or culinary arts, and arrange for newspaper advertising to attract additional applicants. Managers oversee the training of new employees and explain the establishment's policies and practices. They schedule work hours, making sure that enough workers are present to cover each shift. If employees are unable to work, managers may have to call in alternates to cover for them or fill in themselves when needed. Some managers may help with cooking, clearing tables, or other tasks when the restaurant becomes extremely busy.

Food service managers ensure that diners are served properly and in a timely manner. They investigate and resolve customers' complaints about food quality or service. They monitor orders in the kitchen to determine where backups may occur, and they work with the chef to remedy any delays in service. Managers direct the cleaning of the dining areas and the washing of tableware, kitchen utensils, and

equipment to comply with company and government sanitation standards. Managers also monitor the actions of their employees and patrons on a continual basis to ensure the personal safety of everyone. They make sure that health and safety standards and local liquor regulations are obeyed.

In addition to their regular duties, food service managers perform a variety of administrative assignments, such as keeping employee work records, preparing the payroll, and completing paperwork to comply with licensing laws and reporting requirements of tax, wage and hour, unemployment compensation, and Social Security laws. Some of this work may be delegated to an assistant manager or bookkeeper, or it may be contracted out, but most general managers retain responsibility for the accuracy of business records. Managers also maintain records of supply and equipment purchases and ensure that accounts with suppliers are paid.

Technology influences the jobs of food service managers in many ways, enhancing efficiency and productivity. Many restaurants use computers to track orders, inventory, and the seating of patrons. Point-of-service (POS) systems allow servers to key in a customer's order, either at the table, using a hand-held device, or from a computer terminal in the dining room, and send the order to the kitchen instantaneously so preparation can begin. The same system totals and prints checks, functions as a cash register, connects to credit card authorizers, and tracks sales. To minimize food costs and spoilage, many managers use inventory-tracking software to compare the record of sales from the POS with a record of the current inventory. Some establishments enter an inventory of standard ingredients and suppliers into their POS system. When supplies of particular ingredients run low, they can be ordered directly from the supplier using preprogrammed information. Computers also allow restaurant and food service managers to keep track of employee schedules and paychecks more efficiently.

Food service managers use the Internet to track industry news, find recipes, conduct market research, purchase supplies or equipment, recruit employees, and train staff. Internet access also makes service to customers more efficient. Many restaurants maintain Web sites that include menus and online promotions, provide information about the restaurant's location, and offer patrons the option to make a reservation.

Managers tally the cash and charge receipts received and balance them against the record of sales. They are responsible for depositing the day's receipts at the bank or securing them in a safe place. Finally, managers are responsible for locking up the establishment, checking that ovens, grills, and lights are off, and switching on alarm systems.

Working Conditions

Food service managers are among the first to arrive in the morning and the last to leave at night. Long hours—12 to 15 per day, 50 or more per week, and sometimes 7 days a week—are common. Managers of institutional food service facilities, such as school, factory, or office cafeterias, work more regular hours because the operating hours of these establishments usually conform to the operating hours of the business or facility they serve. However, hours for many managers are unpredictable.

Managers should be calm, flexible, and able to work through emergencies, such as a fire or flood, in order to ensure everyone's safety. Managers also should be able to

fill in for absent workers on short notice. Managers often experience the pressures of simultaneously coordinating a wide range of activities. When problems occur, it is the manager's responsibility to resolve them with minimal disruption to customers. The job can be hectic, and dealing with irate customers or uncooperative employees can be stressful.

Managers also may experience the typical minor injuries of other restaurant workers, such as muscle aches, cuts, or burns. They might endure physical discomfort from moving tables or chairs to accommodate large parties, receiving and storing daily supplies from vendors, or making minor repairs to furniture or equipment.

Employment

Food service managers held about 386,000 jobs in 2002. Most managers were salaried, but about one-third were self-employed in independent restaurants or other small food service establishments. Almost three-fourths of all salaried jobs for food service managers were in full-service restaurants or limited-service eating places, such as fast-food restaurants and cafeterias. Other salaried jobs were in drinking places (alcoholic beverages) and in special food services—an industry that includes food service contractors who supply food services at institutional, governmental, commercial, or industrial locations. A small number of salaried jobs were in traveler accommodation (hotels); educational services; amusement, gambling, and recreation industries; nursing care facilities; and hospitals. Jobs are located throughout the country, with large cities and tourist areas providing more opportunities for full-service dining positions.

Training, Other Qualifications, and Advancement

Most food service management companies and national or regional restaurant chains recruit management trainees from 2- and 4-year college hospitality management programs. Restaurant chains prefer to hire people with degrees in restaurant and institutional food service management, but they often hire graduates with degrees in other fields who have demonstrated interest and aptitude. Some restaurant and food service manager positions—particularly self-service and fast-food—are filled by promoting experienced food and beverage preparation and service workers. Waiters, waitresses, chefs, and fast-food workers demonstrating potential for handling increased responsibility sometimes advance to assistant manager or management trainee jobs. Executive chefs need extensive experience working as chefs, and general managers need prior restaurant experience, usually as assistant managers.

A bachelor's degree in restaurant and food service management provides particularly strong preparation for a career in this occupation. A number of colleges and universities offer 4-year programs in restaurant and hotel management or institutional food service management. For those not interested in pursuing a 4-year degree, community and junior colleges, technical institutes, and other institutions offer programs in the field leading to an associate degree or other formal certification. Both 2- and 4-year programs provide instruction in subjects such as nutrition, sanitation, and food planning and preparation, as well as accounting, business law and management, and computer science. Some programs combine classroom and laboratory study with internships providing on-the-job experience. In addition, many educational institutions offer culinary programs in food preparation.

Such training can lead to a career as a cook or chef and provide a foundation for advancement to an executive chef position.

Most restaurant chains and food service management companies have rigorous training programs for management positions. Through a combination of classroom and on-the-job training, trainees receive instruction and gain work experience in all aspects of the operation of a restaurant or institutional food service facility. Areas include food preparation, nutrition, sanitation, security, company policies and procedures, personnel management, recordkeeping, and preparation of reports. Training on use of the restaurant's computer system is increasingly important as well. Usually, after 6 months or a year, trainees receive their first permanent assignment as an assistant manager.

Most employers emphasize personal qualities when hiring managers. For example, self-discipline, initiative, and leadership ability are essential. Managers must be able to solve problems and concentrate on details. They need good communication skills to deal with customers and suppliers, as well as to motivate and direct their staff. A neat and clean appearance is important, because managers must convey self-confidence and show respect in dealing with the public. Food service management can be physically demanding, so good health and stamina also are important.

The certified Foodservice Management Professional (FMP) designation is a measure of professional achievement for food service managers. Although not a requirement for employment or advancement in the occupation, voluntary certification provides recognition of professional competence, particularly for managers who acquired their skills largely on the job. The National Restaurant Association Educational Foundation awards the FMP designation to managers who achieve a qualifying score on a written examination, complete a series of courses that cover a range of food service management topics, and meet standards of work experience in the field.

Willingness to relocate often is essential for advancement to positions with greater responsibility. Managers typically advance to larger establishments or regional management positions within restaurant chains. Some eventually open their own food service establishments.

Job Outlook

Employment of food service managers is expected to grow about as fast as the average for all occupations through 2012. In addition to job openings arising out of employment growth, the need to replace managers who transfer to other occupations or stop working will create many job opportunities. Applicants with a bachelor's or an associate degree in restaurant and institutional food service management should have the best job opportunities.

Projected employment growth varies by industry. Most new jobs will arise in full-service restaurants and limited-service eating places as the number of these establishments increases along with the population. Manager jobs in special food services, an industry that includes food service contractors, will increase as hotels, schools, healthcare facilities, and other businesses contract out their food services to firms in this industry. Food service manager jobs still are expected to increase in hotels, schools, and health-care facilities, but growth will be slowed as contracting out becomes more common.

Job opportunities should be better for salaried managers than for self-employed managers. More new restaurants are affiliated with national chains than are independently owned and operated. As this trend continues, fewer owners will manage restaurants themselves, and more restaurant managers will be employed by larger companies to run individual establishments.

Earnings

Median annual earnings of salaried food service managers were \$35,790 in 2002. The middle 50 percent earned between \$27,910 and \$47,120. The lowest 10 percent earned less than \$21,760, and the highest 10 percent earned more than \$67,490. Median annual earnings in the industries employing the largest numbers of food service managers in 2002 were as follows:

Special food services	\$40,720
Traveler accommodation	39,210
Full-service restaurants	37,280
Nursing care facilities	33,910
Limited-service eating places	33,590
Elementary and secondary schools	31,210

In addition to receiving typical benefits, most salaried food service managers are provided free meals and the opportunity for additional training, depending on their length of service.

Sources of Additional Information

Information about a career as a food service manager, 2- and 4-year college programs in restaurant and food service management, and certification as a Foodservice Management Professional is available from:

- National Restaurant Association Educational Foundation, 175 West Jackson Blvd., Suite 1500, Chicago, IL 60604-2702. Internet: <http://www.nraef.org>
- The International Council on Hotel, Restaurant, and Institutional Education, 2613 North Parham Rd., 2nd Floor, Richmond, VA 23294. Internet: <http://www.chrie.org>

Additional information about job opportunities in food service management may be obtained from local employers and from local offices of state employment services agencies.

Significant Points

- Job opportunities should be excellent because not enough people are seeking training.
- Most workers learn the trade through 4 or 5 years of formal apprenticeship training.
- Pipelayers, plumbers, pipefitters, and steamfitters make up one of the largest and highest paid construction occupations.

Nature of the Work

Most people are familiar with plumbers, who come to their home to unclog a drain or install an appliance. In addition to these activities, however, pipelayers, plumbers, pipefitters, and steamfitters install, maintain, and repair many different types of pipe systems. For example, some systems move water to a municipal water treatment plant and then to residential, commercial, and public buildings. Other systems dispose of waste, provide gas to stoves and furnaces, or supply air-conditioning. Pipe systems in powerplants carry the steam that powers huge turbines. Pipes also are used in manufacturing plants to move material through the production process. Specialized piping systems are very important in both pharmaceutical and computer-chip manufacturing.

Although pipelaying, plumbing, pipefitting, and steamfitting sometimes are considered a single trade, workers generally specialize in one of the four areas. **Pipelayers** lay clay, concrete, plastic, or cast-iron pipe for drains, sewers, water mains, and oil or gas lines. Before laying the pipe, pipelayers prepare and grade the trenches either manually or with machines. **Plumbers** install and repair the water, waste disposal, drainage, and gas systems in homes and commercial and industrial buildings. Plumbers also install plumbing fixtures—bathtubs, showers, sinks, and toilets—and appliances such as dishwashers and water heaters. **Pipefitters** install and repair both high- and low-pressure pipe systems used in manufacturing, in the generation of electricity, and in heating and cooling buildings. They also install automatic controls that are increasingly being used to regulate these systems. Some pipefitters specialize in only one type of system. **Steamfitters**, for example, install pipe systems that move liquids or gases under high pressure. **Sprinklerfitters** install automatic fire sprinkler systems in buildings.

Pipelayers, plumbers, pipefitters, and steamfitters use many different materials and construction techniques, depending on the type of project. Residential water systems, for example, incorporate copper, steel, and plastic pipe that can be handled and installed by one or two workers. Municipal sewerage systems, on the other hand, are made of large cast-iron pipes; installation normally requires crews of pipefitters. Despite these differences, all pipelayers, plumbers, pipefitters, and steamfitters must be able to follow building plans or blueprints and instructions from supervisors, lay out the job, and work efficiently with the materials and tools of the trade. Computers often are used to create blueprints and plan layouts.

When construction plumbers install piping in a house, for example, they work from blueprints or drawings that show the planned location of pipes, plumbing fixtures,

and appliances. Recently, plumbers have become more involved in the design process. Their knowledge of codes and the operation of plumbing systems can cut costs. They first lay out the job to fit the piping into the structure of the house with the least waste of material. Then they measure and mark areas in which pipes will be installed and connected. Construction plumbers also check for obstructions such as electrical wiring and, if necessary, plan the pipe installation around the problem.

Sometimes, plumbers have to cut holes in walls, ceilings, and floors of a house. For some systems, they may hang steel supports from ceiling joists to hold the pipe in place. To assemble a system, plumbers—using saws, pipe cutters, and pipe-bending machines—cut and bend lengths of pipe. They connect lengths of pipe with fittings, using methods that depend on the type of pipe used. For plastic pipe, plumbers connect the sections and fittings with adhesives. For copper pipe, they slide a fitting over the end of the pipe and solder it in place with a torch.

After the piping is in place in the house, plumbers install the fixtures and appliances and connect the system to the outside water or sewer lines. Finally, using pressure gauges, they check the system to ensure that the plumbing works properly.

Working Conditions

Because pipelayers, plumbers, pipefitters, and steamfitters frequently must lift heavy pipes, stand for long periods, and sometimes work in uncomfortable or cramped positions, they need physical strength as well as stamina. They also may have to work outdoors in inclement weather. In addition, they are subject to possible falls from ladders, cuts from sharp tools, and burns from hot pipes or soldering equipment.

Pipelayers, plumbers, pipefitters, and steamfitters engaged in construction generally work a standard 40-hour week; those involved in maintaining pipe systems, including those who provide maintenance services under contract, may have to work evening or weekend shifts, as well as be on call. These maintenance workers may spend quite a bit of time traveling to and from worksites.

Employment

Pipelayers, plumbers, pipefitters, and steamfitters constitute one of the largest construction occupations, holding about 550,000 jobs in 2002. About 7 in 10 worked for plumbing, heating, and air-conditioning contractors engaged in new construction, repair, modernization, or maintenance work. Others did maintenance work for a variety of industrial, commercial, and government employers. For example, pipefitters were employed as maintenance personnel in the petroleum and chemical industries, in which manufacturing operations require the moving of liquids and gases through pipes. About 1 of every 10 pipelayers, plumbers, pipefitters, and steamfitters was self-employed. One in three pipelayers, plumbers, pipefitters, and steamfitters belong to a union.

Jobs for pipelayers, plumbers, pipefitters, and steamfitters are distributed across the country in about the same proportion as the general population.

Training, Other Qualifications, and Advancement

Virtually all pipelayers, plumbers, pipefitters, and steamfitters undergo some type of apprenticeship training. Many apprenticeship programs are administered by local union-management committees made up of members of the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada, and local employers who are members of either the Mechanical Contractors Association of America, the National Association of Plumbing-Heating-Cooling Contractors, or the National Fire Sprinkler Association.

Nonunion training and apprenticeship programs are administered by local chapters of the Associated Builders and Contractors, the National Association of Plumbing-Heating-Cooling Contractors, the American Fire Sprinkler Association, or the Home Builders Institute of the National Association of Home Builders.

Apprenticeships—both union and nonunion—consist of 4 or 5 years of on-the-job training, in addition to at least 144 hours per year of related classroom instruction. Classroom subjects include drafting and blueprint reading, mathematics, applied physics and chemistry, safety, and local plumbing codes and regulations. On the job, apprentices first learn basic skills, such as identifying grades and types of pipe, using the tools of the trade, and safely unloading materials. As apprentices gain experience, they learn how to work with various types of pipe and how to install different piping systems and plumbing fixtures. Apprenticeship gives trainees a thorough knowledge of all aspects of the trade. Although most pipelayers, plumbers, pipefitters, and steamfitters are trained through apprenticeship, some still learn their skills informally on the job.

Applicants for union or nonunion apprentice jobs must be at least 18 years old and in good physical condition. Apprenticeship committees may require applicants to have a high school diploma or its equivalent. Armed Forces training in pipelaying, plumbing, and pipefitting is considered very good preparation. In fact, persons with this background may be given credit for previous experience when entering a civilian apprenticeship program. Secondary or postsecondary courses in shop, plumbing, general mathematics, drafting, blueprint reading, computers, and physics also are good preparation.

Although there are no uniform national licensing requirements, most communities require plumbers to be licensed. Licensing requirements vary from area to area, but most localities require workers to pass an examination that tests their knowledge of the trade and of local plumbing codes.

With additional training, some pipelayers, plumbers, pipefitters, and steamfitters become supervisors for mechanical and plumbing contractors. Others, especially plumbers, go into business for themselves, often starting as a self-employed plumber working from home. Some eventually become owners of businesses employing many workers and may spend most of their time as managers rather than as plumbers. Others move into closely related areas such as construction management or building inspection.

Job Outlook

Job opportunities are expected to be excellent, as demand for skilled pipelayers, plumbers, pipefitters, and steamfitters is expected to outpace the supply of workers trained in this craft. Many potential workers may prefer work that is less strenuous and has more comfortable working conditions.

Employment of pipelayers, plumbers, pipefitters, and steamfitters is expected to grow about as fast as the average for all occupations through the year 2012. Demand for plumbers will stem from building renovation, including the increasing installation of sprinkler systems; repair and maintenance of existing residential systems; and maintenance activities for places having extensive systems of pipes, such as powerplants, water and wastewater treatment plants, pipelines, office buildings, and factories. The enforcement of laws pertaining to the certification requirements of workers on jobsites will create additional opportunities and demand for skilled workers. However, the number of new jobs will be limited by the growing use of plastic pipe and fittings, which are much easier to install and repair than other types, and by increasingly efficient sprinkler systems. In addition to new positions resulting from employment growth, many jobs will become available each year because of the need to replace experienced workers who retire or leave the occupation for other reasons.

Traditionally, many organizations with extensive pipe systems have employed their own plumbers or pipefitters to maintain equipment and keep systems running smoothly. But, to reduce labor costs, many of these firms no longer employ a full-time, in-house plumber or pipefitter. Instead, when they need a plumber, they rely on workers provided under service contracts by plumbing and pipefitting contractors.

Construction projects provide only temporary employment. Therefore, when a project ends, pipelayers, plumbers, pipefitters, and steamfitters working on the project may experience bouts of unemployment. Because construction activity varies from area to area, job openings, as well as apprenticeship opportunities, fluctuate with local economic conditions. However, employment of pipelayers, plumbers, pipefitters, and steamfitters generally is less sensitive to changes in economic conditions than is employment of some other construction trades. Even when construction activity declines, maintenance, rehabilitation, and replacement of existing piping systems, as well as the increasing installation of fire sprinkler systems, provide many jobs for pipelayers, plumbers, pipefitters, and steamfitters.

Earnings

Pipelayers, plumbers, pipefitters, and steamfitters are among the highest paid construction occupations. In 2002, median hourly earnings of pipelayers were \$13.70. The middle 50 percent earned between \$10.96 and \$18.43. The lowest 10 percent earned less than \$9.20, and the highest 10 percent earned more than \$24.31. Also in 2002, median hourly earnings of plumbers, pipefitters, and steamfitters were \$19.31. The middle 50 percent earned between \$14.68 and \$25.87. The lowest 10 percent earned less than \$11.23, and the highest 10 percent earned more than \$32.27. Median hourly earnings in the industries employing the largest numbers of plumbers, pipefitters, and steamfitters in 2002 are shown below.

Nonresidential building construction	\$19.65
Building equipment contractors	19.52
Utility system construction	17.81
Ship and boat building	16.62
Local government	16.21

Apprentices usually begin at about 50 percent of the wage rate paid to experienced pipelayers, plumbers, pipefitters, and steamfitters. Wages increase periodically as skills improve. After an initial waiting period, apprentices receive the same benefits as experienced pipelayers, plumbers, pipefitters, and steamfitters.

Many pipelayers, plumbers, pipefitters, and steamfitters are members of the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada.

Sources of Additional Information

For information about apprenticeships or work opportunities in pipelaying, plumbing, pipefitting, and steamfitting, contact local plumbing, heating, and air-conditioning contractors; a local or State chapter of the National Association of Plumbing, Heating, and Cooling Contractors; a local chapter of the Mechanical Contractors Association; a local chapter of the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada; or the nearest office of your State employment service or apprenticeship agency.

For information about apprenticeship opportunities for pipelayers, plumbers, pipefitters, and steamfitters, contact:

- United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry, 901 Massachusetts Ave. NW., Washington, DC 20001. Internet: <http://www.ua.org>
- Associated Builders and Contractors, Workforce Development Department, 4250 North Fairfax Dr., 9th Floor, Arlington, VA 22203.
- National Association of Home Builders, 1201 15th St. NW., Washington, DC 20005. Internet: <http://www.nahb.org>
- Home Builders Institute, 1201 15th St., NW., Washington, DC 20005. Internet: <http://www.hbi.org>

For general information about the work of pipelayers, plumbers, and pipefitters, contact:

- Mechanical Contractors Association of America, 1385 Piccard Dr., Rockville, MD 20850. Internet: <http://www.mcaa.org>
- National Association of Plumbing-Heating-Cooling Contractors, 180 S. Washington St, Falls Church, VA 22040. Internet: <http://www.phccweb.org> American Fire Sprinkler Association, Inc., 9696 Skillman St. Suite 300, Dallas, TX 75243-8264. Internet: <http://www.firesprinkler.org>
- National Fire Sprinkler Association, P.O. Box 1000, Patterson, NY 12563. Internet: <http://www.nfsa.org>

There are more than 500 occupations registered by the U.S. Department of Labor's National Apprenticeship system. For more information on the Labor Department's registered apprenticeship system and links to state apprenticeship programs, check their website: <http://www.doleta.gov>.

Telecommunications Equipment Installers / Repairers

[Back to Menu](#)

Significant Points

- Employment is projected to decline.
- Applicants with electronics training and computer skills should have the best opportunities.
- Weekend and holiday hours are common; repairers may be on call around the clock in case of emergencies.

Nature of the Work

Telephones and radios depend on a variety of equipment to transmit communications signals. Electronic switches route telephone signals to their destinations. Switchboards direct telephone calls within a single location or organization. Radio transmitters and receivers relay signals from wireless phones and radios to their destinations. Newer telecommunications equipment is computerized and can communicate a variety of information, including data, graphics, and video. The workers who set up and maintain this sophisticated equipment are radio and telecommunications equipment installers and repairers.

Central office installers set up switches, cables, and other equipment in central offices. These locations are the hubs of a telecommunications network—they contain the switches and routers that direct packets of information to their destinations. Although most telephone lines connecting houses to central offices and switching stations are still copper, the lines connecting these central hubs are fiber optic. Fiber optic lines have led to a revolution in switching equipment. The greatly increased transmission capacity of each line has allowed a few fiber optic lines to replace many copper lines. Packet switching equipment is evolving rapidly, ever increasing the amount of information that a single fiber optic line can carry. These switches and routers have the ability to transmit, process, amplify, and direct a massive amount of information. Installing and maintaining this equipment requires a high level of technical knowledge.

The increasing reliability of telephone switches and routers has simplified maintenance. New telephone switches are self-monitoring and alert repairers to malfunctions. Some switches allow repairers to diagnose and correct problems from remote locations. When faced with a malfunction, the repairer may refer to manufacturers' manuals that provide maintenance instructions.

When problems with telecommunications equipment arise, telecommunications equipment repairers diagnose the source of the problem by testing each of the different parts of the equipment, which requires an understanding of how the

software and hardware interact. Repairers often use spectrum and/or network analyzers to locate the problem. A network analyzer sends a signal through the equipment to detect any distortion in the signal. The nature of the signal distortion often directs the repairer to the source of the problem. To fix the equipment, repairers may use small handtools, including pliers and screwdrivers, to remove and replace defective components such as circuit boards or wiring. Newer equipment is easier to repair because whole boards and parts are designed to be quickly removed and replaced. Repairers also may install updated software or programs that maintain existing software.

PBX installers and repairers set up private branch exchange (PBX) switchboards, which relay incoming, outgoing, and interoffice calls within a single location or organization. To install switches and switchboards, installers first connect the equipment to power lines and communications cables and install frames and supports. They test the connections to ensure that adequate power is available and that the communication links function. They also install equipment such as power systems, alarms, and telephone sets. New switches and switchboards are computerized; workers install software or program the equipment to provide specific features. For example, as a cost-cutting feature, an installer may program a PBX switchboard to route calls over different lines at different times of the day. However, other workers, such as computer support specialists generally handle complex programming. Finally, the installer performs tests to verify that the newly installed equipment functions properly. If a problem arises, PBX repairers determine whether it is located within the PBX system or originates in the telephone lines maintained by the local phone company.

Due to rapidly developing technologies, PBX installers must adapt and learn new technologies. Instead of installing PBX systems, many companies are choosing to install voice-over Internet protocol (VoIP) systems. VoIP systems operate like a PBX system, but they use a company's computer wiring to run Internet access, network applications, and telephone communications. Specialized phones have their own Internet protocol (IP) addresses. The phones can be plugged into any port in the system and still use the same number.

Station installers and repairers, telephone—commonly known as telephone installers and repairers or telecommunications service technicians—install and repair telephone wiring and equipment on customers' premises. They install telephone or digital subscriber line (DSL) service by connecting customers' telephone wires to outside service lines. These lines run on telephone poles or in underground conduits. The installer may climb poles or ladders to make the connections. Once the connection is made, the line is tested. When a maintenance problem occurs, repairers test the customers' lines to determine if the problem is located in the customers' premises or in the outside service lines. When onsite procedures fail to resolve installation or maintenance problems, repairers may request support from their technical service center.

Radio mechanics install and maintain radio transmitting and receiving equipment. This includes stationary equipment mounted on transmission towers and mobile equipment, such as radio communications systems in service and emergency vehicles. Radio mechanics do not work on cellular communications towers and equipment. Newer radio equipment is self-monitoring and may alert mechanics to potential malfunctions. When malfunctions occur, these mechanics examine

equipment for damaged components and loose or broken wires. They use electrical measuring instruments to monitor signal strength, transmission capacity, interference, and signal delay, as well as handtools to replace defective components and parts and to adjust equipment so that it performs within required specifications.

Working Conditions

Radio and telecommunications equipment installers and repairers generally work in clean, well-lighted, air-conditioned surroundings, such as a telephone company's central office, a customer's PBX location, or an electronic repair shop or service center. Telephone installers and repairers work on rooftops, ladders, and telephone poles. Telephone and PBX installers must travel to a customer's location. Radio mechanics may maintain equipment located on the tops of transmissions towers. While working outdoors, these workers are subject to a variety of weather conditions.

Nearly all radio and telecommunications equipment installers and repairers work full time. Many work regular business hours to meet the demand for repair services during the workday. Schedules are more irregular at companies that need repair services 24 hours a day or where installation and maintenance must take place after business hours. At these locations, mechanics work a variety of shifts, including weekend and holiday hours. Repairers may be on call around the clock, in case of emergencies, and may have to work overtime.

The work of most repairers involves lifting, reaching, stooping, crouching, and crawling. Adherence to safety precautions is important in order to guard against work hazards. These hazards include falls, minor burns, electrical shock, and contact with hazardous materials.

Employment

Radio and telecommunications equipment installers and repairers held about 226,000 jobs in 2002. About 219,000 were telecommunications equipment installers and repairers, except line installers, mostly working in the telecommunications industry, and the rest were radio mechanics. Radio mechanics worked in electronic and precision equipment repair and maintenance, telecommunications, electronics and appliance stores, and many other industries.

Training, Other Qualifications, and Advancement

Most employers seek applicants with postsecondary training in electronics and a familiarity with computers. Training sources include 2- and 4-year college programs in electronics or communications, trade schools, and equipment and software manufacturers. Military experience with communications equipment is valued by many employers. Many equipment repairers begin working in telecommunications companies as line-installers or telephone installers, before moving up to the job of central office installer and other more complex work.

Newly hired repairers usually receive some training from their employers. This may include formal classroom training in electronics, communications systems, or software and informal hands-on training assisting an experienced repairer. Large

companies may send repairers to outside training sessions to keep them informed about new equipment and service procedures. As networks have become more sophisticated—often including equipment from a variety of companies—the knowledge needed for installation and maintenance also has increased.

Telecommunications equipment companies provide much of the training on specific equipment. With the rapid advances in switches, routers, and other equipment, repairers need to continually take courses and work to obtain manufacturers' certifications on the latest technology.

Repairers must be able to distinguish colors, because wires are color-coded, and they must be able to hear distinctions in the various tones on a telephone system. For positions that require climbing poles and towers, workers must be in good physical shape. Repairers who handle assignments alone at a customer's site must be able to work without close supervision. For workers who frequently contact customers, a pleasant personality, neat appearance, and good communications skills also are important.

Experienced repairers with advanced training may become specialists or troubleshooters who help other repairers diagnose difficult problems, or may work with engineers in designing equipment and developing maintenance procedures. Because of their familiarity with equipment, repairers are particularly well qualified to become manufacturers' sales workers. Workers with leadership ability also may become maintenance supervisors or service managers. Some experienced workers open their own repair services or shops, or become wholesalers or retailers of electronic equipment.

Job Outlook

Employment of radio and telecommunications equipment installers and repairers is expected to decline through 2012. Although the need for installation work will remain as companies seek to upgrade their telecommunications networks, there will be a declining need for maintenance work—performed by telecommunications equipment installers and repairers, except line installers—because of increasingly reliable self-monitoring and self-diagnosing equipment and because installation of higher capacity equipment will reduce the amount of equipment needed. The replacement of two-way radio systems with wireless systems, especially in service vehicles, will eliminate the need in many companies for onsite radio mechanics. The increased reliability of wireless equipment and the use of self-monitoring systems also will continue to lessen the need for radio mechanics. Applicants with electronics training and computer skills should have the best opportunities for radio and telecommunications equipment installer and repairer jobs.

Job opportunities will vary by specialty. For example, opportunities should be available for central office and PBX installers and repairers experienced in current technology, as the growing popularity of VoIP, expanded multimedia offerings such as video on demand, and other telecommunications services continue to place additional demand on telecommunications networks. These new services require high data transfer rates, which can be achieved only by installing new optical switching and routing equipment. Extending high-speed communications from central offices to customers also will require the installation of more advanced switching and routing equipment. Whereas increased reliability and automation of switching equipment will

limit opportunities, these effects will be somewhat offset by the demand for installation and upgrading of switching equipment.

Station installers and repairers can expect keen competition. Prewired buildings and the increasing reliability of telephone equipment will reduce the need for installation and maintenance of customers' telephones. Upgrading internal lines in businesses and the wiring of new homes and businesses with fiber optic lines should offset some of these losses. As cellular telephones have increased in popularity, the number of pay phones is declining, which also will adversely affect employment of station installers and repairers as pay phone installation and maintenance is one of their major functions.

Earnings

In 2002, median hourly earnings of telecommunications equipment installers and repairers, except line installers were \$22.78. The middle 50 percent earned between \$18.07 and \$26.38. The bottom 10 percent earned less than \$13.27, whereas the top 10 percent earned more than \$29.09. Median hourly earnings in the wired telecommunications carriers (telephone) industry were \$24.07 in 2002.

Median hourly earnings of radio mechanics in 2002 were \$17.42. The middle 50 percent earned between \$13.17 and \$22.78. The bottom 10 percent earned less than \$10.34, whereas the top 10 percent earned more than \$28.38.

Sources of Additional Information

- International Brotherhood of Electrical Workers, Telecommunications Department, 1125 15th St. NW., Room 807, Washington, DC 20005.
- Communications Workers of America, 501 3rd St. NW., Washington, DC 20001.
- Electronics Technicians Association International, 5 Depot St., Greencastle, IN 46135.
- Society of Cable Telecommunications Engineers, Certification Department, 140 Phillips Rd., Exton, PA 19341-1318. Internet: <http://www.scte.org>

Electronics Technicians

[Back to Menu](#)

Significant Points

- Training requirements include a high school diploma and, in some cases, postsecondary education, coupled with significant on-the-job training.
- Good opportunities are expected for most types of jobs.
- Overall employment is expected to grow more slowly than average, but projected growth varies by detailed occupation.
- About 1 out of 5 is self-employed.

Nature of the Work

Repairing and maintaining watches, cameras, musical instruments, medical equipment, and other precision instruments requires a high level of skill and

attention to detail. For example, some devices contain tiny gears that must be manufactured to within one one-hundredth of a millimeter of design specifications, and other devices contain sophisticated electronic controls.

Camera and photographic equipment repairers work through a series of steps in fixing a camera. The first step is determining whether a repair should be attempted, because many inexpensive cameras cost more to repair than to replace. Of the problems for which repair seems worthwhile, the most complicated or expensive are referred back to the manufacturer. If the repairers decide to proceed with the job themselves, they diagnose the problem, often by disassembling numerous small parts in order to reach the source. They then make needed adjustments or replace a defective part. Many problems are caused by the electronic circuits used in many cameras, which require an understanding of electronics. Camera repairers also maintain cameras by removing and replacing broken or worn parts and cleaning and lubricating gears and springs. Because many of the components and parts involved are extremely small, repairers must have a great deal of manual dexterity. Frequently, older camera parts are no longer available, requiring repairers to build replacement parts or to strip junked cameras. When machining new parts, workers often use a small lathe, a grinding wheel, and other metalworking tools.

Camera repairers also repair the increasingly popular digital cameras. Repairs on such cameras are similar to those for most modern cameras, but, because digital cameras have no film to wind, they have fewer moving parts.

Watch and clock repairers work almost exclusively on expensive and antique timepieces, as moderately priced timepieces are cheaper to replace than to repair. Electrically powered clocks and quartz watches and clocks function with almost no moving parts, limiting necessary maintenance to replacing the battery. Many expensive timepieces still employ old-style mechanical movements and a manual or automatic winding mechanism. This type of timepiece must be regularly adjusted and maintained. Repair and maintenance work on a mechanical timepiece requires using handtools to disassemble many fine gears and components. Each part is inspected for signs of wear. Some gears or springs may need to be replaced or machined. Exterior portions of the watch may require polishing and buffing. Specialized machines are used to clean all of the parts with ultrasonic waves and a series of baths in cleaning agents. Reassembling a watch requires lubricating key parts.

As with older cameras, replacement parts are frequently unavailable for antique watches or clocks. In such cases, watch repairers must machine their own parts. They employ small lathes and other machines in creating tiny parts.

Musical instrument repairers and tuners combine their love of music with a highly skilled craft. Musical instrument repairers and tuners, often referred to as technicians, work in four specialties: Band instruments, pianos and organs, violins, and guitars.

Band instrument repairers, brass and wind instrument repairers, and percussion instrument repairers focus on woodwind, brass, reed, and percussion instruments damaged through deterioration or by accident. They move mechanical parts or play scales to find problems. They may unscrew and remove rod pins, keys, worn cork

pads, and pistons and remove soldered parts using gas torches. They repair dents in metal and wood using filling techniques or a mallet. These repairers use gas torches, grinding wheels, lathes, shears, mallets, and small handtools and are skilled in metalworking and woodworking. Percussion instrument repairers often must install new drumheads, which are cut from animal skin.

Violin repairers and guitar repairers adjust and repair stringed instruments. Some repairers work on both stringed and band instruments. Initially, repairers play and inspect the instrument to find any defects. They replace or repair cracked or broken sections and damaged parts. They also restring the instruments and repair damage to their finish.

Piano tuners and repairers use similar techniques, skills, and tools. Most workers in this group are piano tuners, tuning and making minor repairs. Tuning involves tightening and loosening different strings to achieve the proper tone or pitch. Because pianos are difficult to transport, tuners normally make house calls. Some repairers specialize in restoring older pianos. Restoration is complicated work, often involving replacing many of the more than 12,000 parts in some pianos. With proper maintenance and restoration, pianos often survive more than 100 years.

Pipe organ repairers do work similar to that of piano repairers, but on a larger scale. Additionally, they assemble new organs. Because pipe organs are too large to transport, they must be assembled onsite. Even with repairers working in teams or with assistants, the organ assembly process can take several weeks or even months, depending upon the size of the organ.

Medical equipment repairers and **other precision instrument and equipment repairers** maintain, adjust, calibrate, and repair electronic, electromechanical, and hydraulic equipment. They use various tools, including multimeters, specialized software, and computers designed to communicate with specific pieces of hardware. Some of their tools are specialized, such as equipment designed to simulate water or air pressure. These repairers use handtools, soldering irons, and other electronic tools to repair and adjust the equipment. Faulty circuit boards and other parts are normally removed and replaced. Medical equipment and other precision instrument repairers must maintain careful, detailed logs of all maintenance and repair on each piece of equipment.

Medical equipment repairers, often called **biomedical equipment technicians**, work on medical equipment such as defibrillators, heart monitors, medical imaging equipment (x rays, CAT scanners, and ultrasound equipment), and electric wheelchairs.

Other precision instrument and equipment repairers service, repair, and replace a wide range of equipment associated with automated or instrument-controlled manufacturing processes. A precision instrument repairer working at an electric power plant, for example, would repair and maintain instruments that monitor the operation of the plant, such as pressure and temperature gauges. Replacement parts are not always available, so repairers sometimes machine or fabricate a new part. Preventive maintenance involves regular lubrication, cleaning, and adjustment of many measuring devices.

Working Conditions

Camera, watch, and musical instrument repairers work under fairly similar solitary, low-stress conditions with minimal supervision. A quiet, well-lighted workshop or repair shop is typical, while a few of these repairers travel to the instrument being repaired, such as a piano, organ, or grandfather clock.

Medical equipment and precision instrument and equipment repairers normally work daytime hours, but are often expected to be on call. But, like other hospital and factory employees, some repairers work irregular hours. Precision instrument repairers work under a wide array of conditions, from hot, dirty, noisy factories to air-conditioned workshops to outdoor fieldwork. Attention to safety is essential, as the work sometimes involves dangerous machinery or toxic chemicals. Due to the individual nature of the work, supervision is fairly minimal.

Employment

Precision instrument and equipment repairers held 64,000 jobs in 2002. Medical equipment repairers often work for hospitals or wholesale equipment suppliers, while precision instrument repairers, all other, often work for manufacturing companies and durable goods wholesalers. About 1 out of 5 precision instrument and equipment repairers was self-employed—they may own jewelry, camera, medical equipment, or music stores. The following tabulation presents employment by detailed occupation:

Medical equipment repairers	29,000
Camera and photographic equipment repairers	6,900
Musical instrument repairers and tuners	6,200
Watch repairers	4,800
All other precision instrument and equipment repairers	17,000

Training, Other Qualifications, and Advancement

Most employers require at least a high school diploma for beginning precision instrument and equipment repairers. Many employers prefer applicants with some postsecondary education. Much training takes place on the job. The ability to read and understand technical manuals is important. Necessary physical qualities include good fine motor skills and vision. Also, precision equipment repairers must be able to pay close attention to details, enjoy problem solving, and have the desire to disassemble machines to see how they work. Most precision equipment repairers must be able to work alone with minimal supervision.

The educational background required for camera and photographic equipment repairers varies, but some knowledge of electronics is necessary. Some workers complete postsecondary training, such as an associate degree, in this field. The job requires the ability to read an electronic schematic diagram and comprehend other technical information, in addition to good manual dexterity. New employees are trained on the job in two stages over about a year. First, they assist a senior repairer for about 6 months. Then, they refine their skills by performing repairs on their own

for an additional 6 months. Finally, repairers continually hone and improve their skills by attending manufacturer-sponsored seminars on the specifics of particular models.

Training also varies for watch and clock repairers. Several associations, including the American Watchmakers-Clockmakers Institute (AWI) and the National Association of Watch and Clock Collectors, offer certifications. Some certifications can be completed in a few months; some require simply passing an examination; and the most demanding certifications require 3,000 hours, over 2 years, of classroom time in technical institutes or colleges. Clock repairers generally require less training than do watch repairers because watches have smaller components and require greater precision. Some repairers opt to learn through assisting a master watch repairer. Nevertheless, developing proficiency in watch or clock repair requires several years of education and experience.

For musical instrument repairers and tuners, employers prefer people with post-high school training in music repair technology. According to a Piano Technicians Guild membership survey, the overwhelming majority of respondents had completed at least some college work; most had a bachelor's or higher degree, although not always in music repair technology. Almost all repairers have a strong musical background. A basic ability to play the instruments being repaired is helpful, but not always required. A few technical schools and colleges offer courses in instrument repair, and correspondence courses also are common. Graduates of these programs normally receive additional training on the job, working with an experienced repairer. A few musical instrument repairers and tuners begin learning their trade on the job as assistants or apprentices. Trainees perform a variety of tasks around the shop. Full qualification usually requires 2 to 5 years of training and practice.

Medical equipment repairers are trained in a similar manner. An associate degree in electronics or medical technology is helpful, but not always required. The required training varies by specialty. On-the-job training, for those with a background in electronics, is more common for workers repairing less critical equipment such as hospital beds or electric wheelchairs. An associate or even a bachelor's degree, often in medical technology or engineering, and a passing grade on a certification exam is likely to be required of persons repairing more critical equipment such as CAT scanners and defibrillators. Some repairers are trained in the military. New repairers begin by observing and assisting an experienced worker over a period of 3 to 6 months. Gradually, they begin working independently, while still under close supervision.

Educational requirements for other precision instrument and equipment repair jobs also vary, but include a high school diploma, with a focus on mathematics and science courses. Most employers require an associate or sometimes a bachelor's degree in instrumentation and control, electronics, or a related engineering field, as repairers need to understand blueprints, electrical schematic diagrams, and electrical, hydraulic, and electromechanical systems. In addition to formal education, a year or two of on-the-job training is required before a repairer is considered fully qualified. Some advancement opportunities exist, but many supervisory positions require a bachelor's degree.

Job Outlook

Good opportunities are expected for most types of precision instrument and equipment repairer jobs. Overall employment growth is projected to be slower than the average for all occupations over the 2002-12 period. However, projected growth varies by detailed occupation.

Job growth among medical equipment repairers should be about as fast as the average for all occupations over the projected period. The rapidly expanding healthcare industry and elderly population should spark demand for increasingly sophisticated medical equipment and, in turn, create good employment opportunities in this occupation.

On the other hand, employment of musical instrument repairers is expected to increase more slowly than the average. Replacement needs will provide the most job opportunities as many repairers and tuners are expected to retire. While an increase in the number of school age children involved with music should spur demand for repairers, music must compete with other extracurricular activities and interests. Without new musicians, there will be a slump in instrument rentals, purchases, and repairs. Because training in the repair of musical instruments is difficult to obtain—there are only a few schools that offer training programs, and few experienced workers are willing to take on apprentices—opportunities should be good for those who receive training.

Employment of camera and photographic equipment repairers is expected to decline. The popularity of inexpensive cameras adversely affects employment in this occupation, as most point-and-shoot cameras are cheaper to replace than repair. The rapid technological progress in digital cameras also has hurt the job prospects of repairers. When a digital camera breaks, not only is replacing the camera often not much more expensive, but the new model is also far more advanced.

Employment of watch repairers is expected to increase more slowly than the average. Over the past few decades, changes in technology, including the invention of digital and quartz watches that need few repairs caused a significant decline in the demand for watch repairers. In recent years, this trend was somewhat reversed, as the growing popularity of expensive mechanical watches increased the need for watch repairers. While the demand for watch repairers has risen, however, few new repairers have entered the field. The small number of entrants, coupled with the fact that a large proportion of watch and clock repairers are approaching retirement age, should result in very good job opportunities in this field.

The projected slower-than-average employment growth of other precision instrument and equipment repairers reflects the expected lack of employment growth in manufacturing and other industries in which they are employed. Nevertheless, good employment opportunities are expected for these precision instrument and equipment repairers due to the relatively small number of people entering the occupation and the need to replace repairers who retire.

Earnings

The following tabulation shows median hourly earnings for various precision instrument and equipment repairers in 2002. Earnings ranged from less than \$7.59

for the lowest 10 percent of watch repairers, to more than \$30.68 for the highest 10 percent of precision instrument and equipment repairers, all other. Median hourly earnings of all precision instrument and equipment repairers by occupation are:

Precision instrument and equipment repairers, all other	\$21.20
Medical equipment repairers	17.49
Camera and photographic equipment repairers	15.09
Musical instrument repairers and tuners	14.15
Watch repairers	12.77

Earnings within the different occupations vary significantly, depending upon skill levels. For example, a watch and clock repairer may simply change batteries and replace worn wrist straps, while highly skilled watch and clock repairers, with years of training and experience, may rebuild and replace worn parts. According to a survey by the American Watchmakers-Clockmakers Institute, the median annual earnings of highly skilled watch and clock repairers were about \$42,500 in 2001.

Sources of Additional Information

- National Association of Photographic Equipment Technicians (NAPET), 3000 Picture Pl., Jackson, MI 49201.
- National Association of Professional Band Instrument Repair Technicians (NAPBIRT), P.O. Box 51, Normal, IL 61761. Internet: <http://www.napbirt.org>
- Piano Technicians Guild, 3930 Washington St., Kansas City, MO 64111-2963. Internet: <http://www.ptg.org>
- ISA-The Instrumentation, Systems, and Automation Society, 67 Alexander Dr., P.O. Box 12277, Research Triangle Park, NC 27709. Internet: <http://www.isa.org>
- American Watchmakers-Clockmakers Institute (AWI), 701 Enterprise Dr., Harrison, OH 45030-1696. Internet: <http://www.awi-net.org>
- Association for the Advancement of Medical Instrumentation (AAMI), 1110 North Glebe Rd., Arlington, VA 22201-4795. Internet: <http://www.aami.org>

Significant Points

- Qualification is based on an examination.
- Overall employment within the U.S. Postal Service is expected to shrink due to declining mail volume and increasing automation.
- Keen competition is expected because the number of qualified applicants should continue to exceed the number of job openings.

Nature of the work

Each week, the U.S. Postal Service delivers billions of pieces of mail, including letters, bills, advertisements, and packages. To do this in an efficient and timely manner, the Postal Service employs about 845,000 individuals. Most Postal Service workers are clerks, mail carriers, or mail sorters, processors, and processing machine operators. Postal clerks wait on customers at post offices, whereas mail sorters, processors, and processing machine operators sort incoming and outgoing mail at post offices and mail processing centers. Mail carriers deliver mail to urban and rural residences and businesses throughout the United States.

Postal service clerks, also known as window clerks, sell stamps, money orders, postal stationary, and mailing envelopes and boxes. They also weigh packages to determine postage and check that packages are in satisfactory condition for mailing. These clerks register, certify, and insure mail and answer questions about postage rates, post office boxes, mailing restrictions, and other postal matters. Window clerks also help customers file claims for damaged packages.

Postal service mail sorters, processors, and processing machine operators prepare incoming and outgoing mail for distribution. These workers are commonly referred to as mail handlers, distribution clerks, mail processors, or mail processing clerks. They load and unload postal trucks and move mail around a mail processing center with forklifts, small electric tractors, or hand-pushed carts. They also load and operate mail processing, sorting, and canceling machinery.

Postal service mail carriers deliver mail, once it has been processed and sorted. Although carriers are classified by their type of route—either city or rural—duties of city and rural carriers are similar. Most travel established routes, delivering and collecting mail. Mail carriers start work at the post office early in the morning, when they arrange the mail in delivery sequence. Automated equipment has reduced the time that carriers need to sort the mail, allowing them to spend more time delivering it.

Mail carriers cover their routes on foot, by vehicle, or a combination of both. On foot, they carry a heavy load of mail in a satchel or push it on a cart. In most urban and rural areas, they use a car or small truck. Although the Postal Service provides vehicles to city carriers, most rural carriers must use their own automobiles. Deliveries are made house-to-house, to roadside mailboxes, and to large buildings such as offices or apartments, which generally have all of their tenants' mailboxes in one location.

Besides delivering and collecting mail, carriers collect money for postage-due and COD (cash-on-delivery) fees and obtain signed receipts for registered, certified, and insured mail. If a customer is not home, the carrier leaves a notice that tells where special mail is being held. After completing their routes, carriers return to the post office with mail gathered from street collection boxes, homes, and businesses and turn in the mail, receipts, and money collected during the day.

Some city carriers may have specialized duties such as delivering only parcels or picking up mail from mail collection boxes. In contrast to city carriers, rural carriers provide a wider range of postal services, in addition to delivering and picking up mail. For example, rural carriers may sell stamps and money orders and register, certify, and insure parcels and letters. All carriers, however, must be able to answer customers' questions about postal regulations and services and provide change-of-address cards and other postal forms when requested.

Working Conditions

Window clerks usually work in the public portion of clean, well-ventilated, and well-lit buildings. They have a variety of duties and frequent contact with the public, but they rarely work at night. However, they may have to deal with upset customers, stand for long periods, and be held accountable for an assigned stock of stamps and funds. Depending on the size of the post office in which they work, they also may be required to sort mail.

Despite the use of automated equipment, the work of mail sorters, processors, and processing machine operators can be physically demanding. Workers may have to move heavy sacks of mail around a mail processing center. These workers usually are on their feet, reaching for sacks and trays of mail or placing packages and bundles into sacks and trays. Processing mail can be tiring and boring. Many sorters, processors, and machine operators work at night or on weekends, because most large post offices process mail around the clock, and the largest volume of mail is sorted during the evening and night shifts. Workers can experience stress as they process ever-larger quantities of mail under tight production deadlines and quotas.

Most carriers begin work early in the morning—those with routes in a business district can start as early as 4 a.m. Overtime hours are frequently required for urban carriers. A carrier's schedule has its advantages, however. Carriers who begin work early in the morning are through by early afternoon and spend most of the day on their own, relatively free from direct supervision. Carriers spend most of their time outdoors, delivering mail in all kinds of weather. Even those who drive often must walk periodically when making deliveries and must lift heavy sacks of parcel post items when loading their vehicles. In addition, carriers must be cautious of potential hazards on their routes. Wet and icy roads and sidewalks can be treacherous, and each year dogs attack numerous carriers.

Employment

The U.S. Postal Service employed 77,000 clerks; 334,000 mail carriers; and 253,000 mail sorters, processors, and processing machine operators in 2002. Most of them worked full time. Most postal clerks provided window service at post office branches. Many mail sorters, processors, and processing machine operators sorted mail at major metropolitan post offices; others worked at mail processing centers. The

majority of mail carriers worked in cities and suburbs, while the rest worked in rural areas.

Postal Service workers are classified as casual, part-time flexible, part-time regular, or full time. Casuals are hired for 90 days at a time to help process and deliver mail during peak mailing or vacation periods. Part-time flexible workers do not have a regular work schedule or weekly guarantee of hours but are called as the need arises. Part-time regulars have a set work schedule of fewer than 40 hours per week, often replacing regular full-time workers on their scheduled day off. Full-time postal employees work a 40-hour week over a 5-day period.

Training, Other Qualifications, and Advancement

Postal Service workers must be at least 18 years old. They must be U.S. citizens or have been granted permanent resident-alien status in the United States, and males must have registered with the Selective Service upon reaching age 18. Applicants should have a basic competency of English. Qualification is based on a written examination that measures speed and accuracy at checking names and numbers and the ability to memorize mail distribution procedures. Applicants must pass a physical examination and drug test, and may be asked to show that they can lift and handle mail sacks weighing 70 pounds. Applicants for mail carrier positions must have a driver's license and a good driving record, and must receive a passing grade on a road test.

Jobseekers should contact the post office or mail processing center where they wish to work to determine when an exam will be given. Applicants' names are listed in order of their examination scores. Five points are added to the score of an honorably discharged veteran and 10 points are added to the score of a veteran who was wounded in combat or is disabled. When a vacancy occurs, the appointing officer chooses one of the top three applicants; the rest of the names remain on the list to be considered for future openings until their eligibility expires—usually 2 years after the examination date.

Relatively few people become postal clerks or mail carriers on their first job, because of keen competition and the customary waiting period of 1 to 2 years or more after passing the examination. It is not surprising, therefore, that most entrants transfer from other occupations.

New Postal Service workers are trained on the job by experienced workers. Many post offices offer classroom instruction on safety and defensive driving. Workers receive additional instruction when new equipment or procedures are introduced. In these cases, workers usually are trained by another postal employee or a training specialist.

Postal clerks and mail carriers should be courteous and tactful when dealing with the public, especially when answering questions or receiving complaints. A good memory and the ability to read rapidly and accurately are important. Good interpersonal skills also are vital, because mail distribution clerks work closely with other postal workers, frequently under the tension and strain of meeting dispatch or transportation deadlines and quotas.

Postal Service workers often begin on a part-time, flexible basis and become regular or full time in order of seniority, as vacancies occur. Full-time workers may bid for preferred assignments, such as the day shift or a high-level non-supervisory position. Carriers can look forward to obtaining preferred routes as their seniority increases. Postal Service workers can advance to supervisory positions on a competitive basis.

Job Outlook

Employment of Postal Service workers is expected to decline through 2012. Still, many jobs will become available because of the need to replace those who retire or leave the occupation. Those seeking jobs as Postal Service workers can expect to encounter keen competition. The number of applicants should continue to exceed the number of job openings due to low entry requirements and attractive wages and benefits.

A small decline in employment is expected among window clerks over the 2002-12 projection period. Efforts by the Postal Service to provide better service may somewhat increase the demand for window clerks, but the demand for such clerks will be offset by the use of electronic communications technologies and private delivery companies. Employment of mail sorters, processors, and processing machine operators is expected to decline because of the increasing use of automated materials handling equipment and optical character readers, barcode sorters, and other automated sorting equipment.

Several factors are expected to influence demand for mail carriers. The competition from alternative delivery systems and new forms of electronic communication could decrease the total volume of mail handled. Most of the decrease is expected to consist of first-class mail. The Postal Service expects an increase in package deliveries due to the rising number of purchases made through the Internet. Although total mail volume may decrease, the number of addresses to which mail must be delivered will continue to grow. However, increased use of the "delivery point sequencing" system, which allows machines to sort mail directly by the order of delivery, should reduce the amount of time that carriers spend sorting their mail, allowing them more time to handle longer routes. In addition, the Postal Service is moving toward more centralized mail delivery, such as the use of cluster boxes, to cut down on the number of door-to-door deliveries. These trends are expected to increase carrier productivity, resulting in a small decline in employment among mail carriers over the projection period. The increasing number of delivery points may result in greater demand for rural mail carriers than for city mail carriers, as much of the increase in delivery points will be seen in less urbanized areas.

Currently, the role of the Postal Service as a government-approved monopoly is a topic of debate. Any legislative changes that would privatize or deregulate the Postal Service might affect employment of all its workers. Employment and schedules in the Postal Service fluctuate with the demand for its services. When mail volume is high, full-time workers work overtime, part-time workers get additional hours, and casual workers may be hired. When mail volume is low, overtime is curtailed, part-timers work fewer hours, and casual workers are discharged.

Earnings

Median annual earnings of postal mail carriers were \$39,530 in 2002. The middle 50 percent earned between \$36,020 and \$43,040. The lowest 10 percent had earnings of less than \$31,180, while the top 10 percent earned over \$47,500. Rural mail carriers are reimbursed for mileage put on their own vehicles while delivering mail.

Median annual earnings of Postal Service clerks were \$39,700 in 2002. The middle 50 percent earned between \$37,160 and \$42,230. The lowest 10 percent had earnings of less than \$35,640, while the top 10 percent earned more than \$43,750.

Median annual earnings of mail sorters, processors, and processing machine operators were \$38,150 in 2002. The middle 50 percent earned between \$30,140 and \$41,450. The lowest 10 percent had earnings of less than \$21,680, while the top 10 percent earned more than \$43,430.

Postal Service workers enjoy a variety of employer-provided benefits similar to those enjoyed by Federal Government workers. The American Postal Workers Union, the National Association of Letter Carriers, the National Postal Mail Handlers Union, and the National Rural Letter Carriers Association together represent most of these workers.

Sources of Additional Information

Local post offices and State employment service offices can supply details about entrance examinations and specific employment opportunities for Postal Service workers.

Truck Drivers

[Back to Menu](#)

Significant Points

- Job opportunities should be favorable.
- Competition is expected for jobs offering the highest earnings or most favorable work schedules.
- A commercial driver's license is required to operate most larger trucks.

Nature of the Work

Truck drivers are a constant presence on the Nation's highways and interstates, delivering everything from automobiles to canned foods. Firms of all kinds rely on trucks for pickup and delivery of goods because no other form of transportation can deliver goods door to door. Even if goods travel in part by ship, train, or airplane, trucks carry nearly all goods at some point in their journey from producer to consumer.

Before leaving the terminal or warehouse, truck drivers check the fuel level and oil in their trucks. They also inspect the trucks to make sure the brakes, windshield wipers, and lights are working and that a fire extinguisher, flares, and other safety

equipment are aboard and in working order. Drivers make sure their cargo is secure and adjust their mirrors so that both sides of the truck are visible from the driver's seat. Drivers report equipment that is inoperable, missing, or loaded improperly to the dispatcher.

Once under way, drivers must be alert to prevent accidents. Drivers can see farther down the road, because large trucks sit higher than most other vehicles. This allows drivers to seek traffic lanes that allow for a steady speed, while keeping sight of varying road conditions.

Delivery time varies according to the type of merchandise and its final destination. Local drivers may provide daily service for a specific route, while other drivers make intercity and interstate deliveries that take longer and may vary from job to job. The driver's responsibilities and assignments change according to the time spent on the road, the type of payloads transported, and vehicle size.

New technologies are changing the way truck drivers work, especially long-distance truck drivers. Satellites and Global Positioning Systems (GPS) link many trucks with company headquarters. Troubleshooting information, directions, weather reports, and other important communications can be delivered to the truck, anywhere, within seconds. Drivers can easily communicate with the dispatcher to discuss delivery schedules and courses of action in the event of mechanical problems. The satellite linkup also allows the dispatcher to track the truck's location, fuel consumption, and engine performance. Many drivers also work with computerized inventory tracking equipment. It is important for the producer, warehouse, and customer to know the product's location at all times, in order to keep costs low and the quality of service high.

Heavy truck and tractor-trailer drivers drive trucks or vans with a capacity of at least 26,000 pounds Gross Vehicle Weight (GVW). They transport goods including cars, livestock, and other materials in liquid, loose, or packaged form. Many routes are from city to city and cover long distances. Some companies use two drivers on very long runs—one drives while the other sleeps in a berth behind the cab. "Sleeper" runs may last for days, or even weeks, usually with the truck stopping only for fuel, food, loading, and unloading.

Some heavy truck and tractor-trailer drivers who have regular runs transport freight to the same city on a regular basis. Other drivers perform unscheduled runs because shippers request varying service to different cities every day.

After these truck drivers reach their destination or complete their operating shift, the U.S. Department of Transportation requires that they complete reports detailing the trip, the condition of the truck, and the circumstances of any accidents. In addition, Federal regulations require employers to subject drivers to random alcohol and drug tests while they are on duty.

Long-distance heavy truck and tractor-trailer drivers spend most of their working time behind the wheel, but may load or unload their cargo after arriving at the final destination. This is especially common when drivers haul specialty cargo, because they may be the only one at the destination familiar with procedures or certified to handle the materials. Auto-transport drivers, for example, position cars on the trailers at the manufacturing plant and remove them at the dealerships. When

picking up or delivering furniture, drivers of long-distance moving vans hire local workers to help them load or unload.

Light or delivery services truck drivers drive trucks or vans with a capacity under 26,000 pounds GVW. They deliver or pick up merchandise and packages within a specific area. This may include short “turnarounds” to deliver a shipment to a nearby city, pick up another loaded truck or van, and drive it back to their home base the same day. These services may require use of electronic delivery tracking systems to track the whereabouts of the merchandise or packages. Light or delivery services truck drivers usually load or unload the merchandise at the customer’s place of business. They may have helpers if there are many deliveries to make during the day, or if the load requires heavy moving. Typically, before the driver arrives for work, material handlers load the trucks and arrange items to improve delivery efficiency. Customers must sign receipts for goods and pay drivers the balance due on the merchandise if there is a cash-on-delivery arrangement. At the end of the day, drivers turn in receipts, money, records of deliveries made, and any reports on mechanical problems with their trucks.

Some local truck drivers have sales and customer service responsibilities. The primary responsibility of *driver/sales workers*, or *route drivers*, is to deliver and sell their firm’s products over established routes or within an established territory. They sell goods such as food products, including restaurant takeout items, or pick up and deliver items such as laundry. Their response to customer complaints and requests can make the difference between a large order and a lost customer. Route drivers may also take orders and collect payments.

The duties of driver/sales workers vary according to their industry, the policies of their particular company, and the emphasis placed on their sales responsibility. Most have wholesale routes that deliver to businesses and stores, rather than to homes. For example, wholesale bakery driver/sales workers deliver and arrange bread, cakes, rolls, and other baked goods on display racks in grocery stores. They estimate how many of each item to stock by paying close attention to what is selling. They may recommend changes in a store’s order or encourage the manager to stock new bakery products. Laundries that rent linens, towels, work clothes, and other items employ driver/sales workers to visit businesses regularly to replace soiled laundry. From time to time, they solicit new orders from businesses along their route.

After completing their route, driver/sales workers order items for the next delivery based on product sales trends, weather, and customer requests.

Working Conditions

Truck driving has become less physically demanding because most trucks now have more comfortable seats, better ventilation, and improved, ergonomically designed cabs. Although these changes make the work environment more attractive, driving for many hours at a stretch, unloading cargo, and making many deliveries can be tiring. Local truck drivers, unlike long-distance drivers, usually return home in the evening. Some self-employed long-distance truck drivers who own and operate their trucks spend most of the year away from home.

Design improvements in newer trucks reduce stress and increase the efficiency of long-distance drivers. Many of the newer trucks are virtual mini-apartments on wheels, equipped with refrigerators, televisions, and bunks.

The U.S. Department of Transportation governs work hours and other working conditions of truck drivers engaged in interstate commerce. A long-distance driver cannot work more than 60 hours in any 7-day period. Federal regulations also require that truckers rest 10 hours for every 11 hours of driving. Many drivers, particularly on long runs, work close to the maximum time permitted because they typically are compensated according to the number of miles or hours they drive. Drivers on long runs may face boredom, loneliness, and fatigue. Drivers frequently travel at night, and on holidays and weekends, to avoid traffic delays and deliver cargo on time.

Local truck drivers frequently work 50 or more hours a week. Drivers who handle food for chain grocery stores, produce markets, or bakeries typically work long hours, starting late at night or early in the morning. Although most drivers have regular routes, some have different routes each day. Many local truck drivers, particularly driver/sales workers, load and unload their own trucks. This requires considerable lifting, carrying, and walking each day.

Employment

Truck drivers and driver/sales workers held about 3.2 million jobs in 2002. Of these workers, 431,000 were driver/sales workers and 2.8 million were truck drivers. Most truck drivers find employment in large metropolitan areas along major interstate roadways where major trucking, retail, and wholesale companies have distribution outlets. Some drivers work in rural areas, providing specialized services such as delivering newspapers to customers or coal to a railroad.

The truck transportation industry employed almost one-quarter of all truck drivers and driver/sales workers in the United States. Another quarter worked for companies engaged in wholesale or retail trade. The remaining truck drivers and driver/sales workers were distributed across many industries, including construction and manufacturing.

Over 10 percent of all truck drivers and driver/sales workers were self-employed. Of these, a significant number were owner-operators who either served a variety of businesses independently or leased their services and trucks to a trucking company.

Training, Other Qualifications, and Advancement

State and Federal regulations govern the qualifications and standards for truck drivers. All drivers must comply with Federal regulations and any State regulations that are stricter than Federal requirements. Truck drivers must have a driver's license issued by the State in which they live, and most employers require a clean driving record. Drivers of trucks designed to carry 26,000 pounds or more—including most tractor-trailers, as well as bigger straight trucks—must obtain a commercial driver's license (CDL) from the State in which they live. All truck drivers who operate trucks transporting hazardous materials must obtain a CDL, regardless of truck size. Federal regulations governing the CDL exempt certain groups, including farmers, emergency medical technicians, firefighters, some military drivers, and snow and ice

removers. In many States, a regular driver's license is sufficient for driving light trucks and vans.

To qualify for a commercial driver's license, applicants must pass a written test on rules and regulations, and then demonstrate that they can operate a commercial truck safely. A national database permanently records all driving violations incurred by persons who hold commercial licenses. A State will check these records and deny a commercial driver's license to a driver who already has a license suspended or revoked in another State. Licensed drivers must accompany trainees until the trainees get their own CDL. Information on how to apply for a commercial driver's license may be obtained from State motor vehicle administrations.

While many States allow those who are at least 18 years old to drive trucks within their borders, the U.S. Department of Transportation establishes minimum qualifications for truck drivers engaged in interstate commerce. Federal Motor Carrier Safety Regulations require drivers to be at least 21 years old and to pass a physical examination once every 2 years. The main physical requirements include good hearing, at least 20/40 vision with glasses or corrective lenses, and a 70-degree field of vision in each eye. Drivers cannot be colorblind. Drivers must be able to hear a forced whisper in one ear at not less than 5 feet, with a hearing aide if needed. Drivers must have normal use of arms and legs and normal blood pressure. Drivers cannot use any controlled substances, unless prescribed by a licensed physician. Persons with epilepsy or diabetes controlled by insulin are not permitted to be interstate truck drivers. Federal regulations also require employers to test their drivers for alcohol and drug use as a condition of employment, and require periodic random tests of the drivers while they are on duty. In addition, drivers must have no criminal records such as felonies involving the use of a motor vehicle; any crime involving drugs, including driving under the influence of drugs or alcohol; and any hit-and-run accident that resulted in injury or death. All drivers must be able to read and speak English well enough to read road signs, prepare reports, and communicate with law enforcement officers and the public. Also, drivers must take a written examination on the Motor Carrier Safety Regulations of the U.S. Department of Transportation.

Many trucking operations have higher standards than those described. Many firms require that drivers be at least 22 years old, be able to lift heavy objects, and have driven trucks for 3 to 5 years. Many prefer to hire high school graduates and require annual physical examinations. Companies have an economic incentive to hire less risky drivers. Good drivers drive more efficiently, using less fuel and costing less to insure.

Taking driver-training courses is a desirable method of preparing for truck driving jobs and for obtaining a commercial driver's license. High school courses in driver training and automotive mechanics also may be helpful. Many private and public vocational-technical schools offer tractor-trailer driver training programs. Students learn to maneuver large vehicles on crowded streets and in highway traffic. They also learn to inspect trucks and freight for compliance with regulations. Some programs provide only a limited amount of actual driving experience, and completion of a program does not guarantee a job. Persons interested in attending a driving school should check with local trucking companies to make sure the school's training is acceptable. Some States require prospective drivers to complete a training course in basic truck driving before being issued their CDL. The Professional Truck Driver

Institute (PTDI), a nonprofit organization established by the trucking industry, manufacturers, and others, certifies driver training programs at truck driver training schools that meet industry standards and Federal Highway Administration guidelines for training tractor-trailer drivers.

Drivers must get along well with people because they often deal directly with customers. Employers seek driver/sales workers who speak well and have self-confidence, initiative, tact, and a neat appearance. Employers also look for responsible, self-motivated individuals able to work with little supervision.

Training given to new drivers by employers is usually informal, and may consist of only a few hours of instruction from an experienced driver, sometimes on the new employee's own time. New drivers may also ride with and observe experienced drivers before assignment of their own runs. Drivers receive additional training to drive special types of trucks or handle hazardous materials. Some companies give 1 to 2 days of classroom instruction covering general duties, the operation and loading of a truck, company policies, and the preparation of delivery forms and company records. Driver/sales workers also receive training on the various types of products the company carries, so that they will be effective sales workers.

Although most new truck drivers are assigned immediately to regular driving jobs, some start as extra drivers, substituting for regular drivers who are ill or on vacation. They receive a regular assignment when an opening occurs.

New drivers sometimes start on panel trucks or other small straight trucks. As they gain experience and show competent driving skills, they may advance to larger and heavier trucks, and finally to tractor-trailers.

Advancement of truck drivers generally is limited to driving runs that provide increased earnings or preferred schedules and working conditions. For the most part, a local truck driver may advance to driving heavy or special types of trucks, or transfer to long-distance truck driving. Working for companies that also employ long-distance drivers is the best way to advance to these positions. A few truck drivers may advance to dispatcher, manager, or traffic work—for example, planning delivery schedules.

Some long-distance truck drivers purchase a truck and go into business for themselves. Although many of these owner-operators are successful, some fail to cover expenses and eventually go out of business. Owner-operators should have good business sense as well as truck driving experience. Courses in accounting, business, and business mathematics are helpful, and knowledge of truck mechanics can enable owner-operators to perform their own routine maintenance and minor repairs.

Job Outlook

Job opportunities should be favorable for truck drivers. In addition to growth in demand for truck drivers, numerous job openings will occur as experienced drivers leave this large occupation to transfer to other fields of work, retire, or leave the labor force for other reasons. Jobs vary greatly in terms of earnings, weekly work hours, number of nights spent on the road, and quality of equipment operated.

Because this occupation does not require education beyond high school, competition is expected for jobs with the most attractive earnings and working conditions.

Overall employment of truck drivers and driver/sales workers is expected to grow about as fast as the average for all occupations through the year 2012, due to growth in the economy and in the amount of freight carried by truck. The increased use of rail, air, and ship transportation requires truck drivers to pick up and deliver shipments. Demand for long-distance drivers will remain strong because these drivers transport perishable and time-sensitive goods more efficiently than do alternative modes of transportation, such as railroads. Job opportunities for truck drivers with less-than-truckload carriers will be more competitive than those with truckload carriers because of the more desirable working conditions for less-than-truckload carriers.

Faster than average growth of light and heavy truck driver employment will outweigh relatively slow growth in driver/sales worker jobs. The number of truck drivers with sales responsibilities is expected to increase more slowly than the average for all other occupations as companies increasingly shift sales, ordering, and customer service tasks to sales and office staffs, and use regular truck drivers to make deliveries to customers.

Job opportunities may vary from year to year, because the strength of the economy dictates the amount of freight moved by trucks. Companies tend to hire more drivers when the economy is strong and deliveries are in high demand. Consequently, when the economy slows, employers hire fewer drivers, or even lay off drivers. Independent owner-operators are particularly vulnerable to slowdowns. Industries least likely to be affected by economic fluctuation, such as grocery stores, tend to be the most stable places for employment.

Earnings

Median hourly earnings of heavy truck and tractor-trailer drivers were \$15.97 in 2002. The middle 50 percent earned between \$12.51 and \$20.01 an hour. The lowest 10 percent earned less than \$10.01, and the highest 10 percent earned more than \$23.75 an hour. Median hourly earnings in the industries employing the largest numbers of heavy truck and tractor-trailer drivers in 2002 were as follows:

General freight trucking	\$17.56
Grocery and related product wholesalers	16.90
Specialized freight trucking	15.79
Other specialty trade contractors	14.25
Cement and concrete product manufacturing	14.14

Median hourly earnings of light or delivery services truck drivers were \$11.48 in 2002. The middle 50 percent earned between \$8.75 and \$15.57 an hour. The lowest 10 percent earned less than \$7.03, and the highest 10 percent earned more than \$20.68 an hour. Median hourly earnings in the industries employing the largest numbers of light or delivery services truck drivers in 2002 were as follows:

Couriers	\$17.48
General freight trucking	14.92
Grocery and related product wholesalers	12.26
Building material and supplies dealers	10.83
Automotive parts, accessories, and tire stores	7.82

Median hourly earnings of driver/sales workers, including commission, were \$9.92 in 2002. The middle 50 percent earned between \$6.98 and \$14.70 an hour. The lowest 10 percent earned less than \$6.07, and the highest 10 percent earned more than \$19.60 an hour. Median hourly earnings in the industries employing the largest numbers of driver/sales workers in 2002 were as follows:

Specialty food stores	\$14.98
Drycleaning and laundry services	14.74
Grocery and related product wholesalers	12.66
Limited-service eating places	6.78
Full-service restaurants	6.47

As a general rule, local truck drivers receive an hourly wage and extra pay for working overtime, usually after 40 hours. Employers pay long-distance drivers primarily by the mile. Their rate per mile can vary greatly from employer to employer and may even depend on the type of cargo. Typically, earnings increase with mileage driven, seniority, and the size and type of truck driven. Most driver/sales workers receive a commission based on their sales in addition to an hourly wage.

Most self-employed truck drivers are primarily engaged in long-distance hauling. Many truck drivers are members of the International Brotherhood of Teamsters. Some truck drivers employed by companies outside the trucking industry are members of unions representing the plant workers of the companies for which they work.

Sources of Additional Information

Information on truck driver employment opportunities is available from local trucking companies and local offices of the state employment service. Information on career opportunities in truck driving may be obtained from:

- American Trucking Associations, Inc., 2200 Mill Rd., Alexandria, VA 22314.
Internet: <http://www.trucking.org>
- Professional Truck Driver Institute, 2200 Mill Rd., Alexandria, VA 22314.
Internet: <http://www.ptdi.org>

Significant Points

- Police work can be dangerous and stressful.
- Civil service regulations govern the appointment of police and detectives.
- Competition should remain keen for higher paying jobs with State and Federal agencies and police departments in affluent areas; opportunities will be better in local and special police departments that offer relatively low salaries or in urban communities where the crime rate is relatively high.
- Applicants with college training in police science or military police experience should have the best opportunities.

Nature of the Work

People depend on police officers and detectives to protect their lives and property. Law enforcement officers, some of whom are State or Federal special agents or inspectors, perform these duties in a variety of ways, depending on the size and type of their organization. In most jurisdictions, they are expected to exercise authority when necessary, whether on or off duty.

Uniformed police officers who work in municipal police departments of various sizes, small communities, and rural areas have general law enforcement duties including maintaining regular patrols and responding to calls for service. They may direct traffic at the scene of a fire, investigate a burglary, or give first aid to an accident victim. In large police departments, officers usually are assigned to a specific type of duty. Many urban police agencies are becoming more involved in community policing—a practice in which an officer builds relationships with the citizens of local neighborhoods and mobilizes the public to help fight crime.

Police agencies are usually organized into geographic districts, with uniformed officers assigned to patrol a specific area, such as part of the business district or outlying residential neighborhoods. Officers may work alone, but in large agencies they often patrol with a partner. While on patrol, officers attempt to become thoroughly familiar with their patrol area and remain alert for anything unusual. Suspicious circumstances and hazards to public safety are investigated or noted, and officers are dispatched to individual calls for assistance within their district. During their shift, they may identify, pursue, and arrest suspected criminals, resolve problems within the community, and enforce traffic laws.

Public college and university police forces, public school district police, and agencies serving transportation systems and facilities are examples of special police agencies. These agencies have special geographic jurisdictions or enforcement responsibilities in the United States. Most sworn personnel in special agencies are uniformed officers, a smaller number are investigators.

Some police officers specialize in such diverse fields as chemical and microscopic analysis, training and firearms instruction, or handwriting and fingerprint identification. Others work with special units such as horseback, bicycle, motorcycle or harbor patrol, canine corps, or special weapons and tactics (SWAT) or emergency

response teams. A few local and special law enforcement officers primarily perform jail-related duties or work in courts. Regardless of job duties or location, police officers and detectives at all levels must write reports and maintain meticulous records that will be needed if they testify in court.

Sheriffs and deputy sheriffs enforce the law on the county level. Sheriffs are usually elected to their posts and perform duties similar to those of a local or county police chief. Sheriffs' departments tend to be relatively small, most having fewer than 25 sworn officers. A deputy sheriff in a large agency will have law enforcement duties similar to those of officers in urban police departments. Police and sheriffs' deputies who provide security in city and county courts are sometimes called bailiffs.

State police officers (sometimes called *State troopers* or *highway patrol officers*) arrest criminals Statewide and patrol highways to enforce motor vehicle laws and regulations. Uniformed officers are best known for issuing traffic citations to motorists who violate the law. At the scene of accidents, they may direct traffic, give first aid, and call for emergency equipment. They also write reports used to determine the cause of the accident. State police officers are frequently called upon to render assistance to other law enforcement agencies, especially those in rural areas or small towns.

State law enforcement agencies operate in every state except Hawaii. Most full-time sworn personnel are uniformed officers who regularly patrol and respond to calls for service. Others are investigators, perform court-related duties, or work in administrative or other assignments.

Detectives are plainclothes investigators who gather facts and collect evidence for criminal cases. Some are assigned to interagency task forces to combat specific types of crime. They conduct interviews, examine records, observe the activities of suspects, and participate in raids or arrests. Detectives and State and Federal agents and inspectors usually specialize in one of a wide variety of violations such as homicide or fraud. They are assigned cases on a rotating basis and work on them until an arrest and conviction occurs or the case is dropped.

The Federal Government maintains a high profile in many areas of law enforcement. **Federal Bureau of Investigation (FBI) agents** are the Government's principal investigators, responsible for investigating violations of more than 260 statutes and conducting sensitive national security investigations. Agents may conduct surveillance, monitor court-authorized wiretaps, examine business records, investigate white-collar crime, track the interstate movement of stolen property, collect evidence of espionage activities, or participate in sensitive undercover assignments. The FBI investigates organized crime, public corruption, financial crime, fraud against the government, bribery, copyright infringement, civil rights violations, bank robbery, extortion, kidnapping, air piracy, terrorism, espionage, interstate criminal activity, drug trafficking, and other violations of Federal statutes.

U.S. Drug Enforcement Administration (DEA) agents enforce laws and regulations relating to illegal drugs. Not only is the DEA the lead agency for domestic enforcement of Federal drug laws, it also has sole responsibility for coordinating and pursuing U.S. drug investigations abroad. Agents may conduct complex criminal investigations, carry out surveillance of criminals, and infiltrate illicit drug organizations using undercover techniques.

U.S. marshals and deputy marshals protect the federal courts and ensure the effective operation of the judicial system. They provide protection for the Federal judiciary, transport federal prisoners, protect federal witnesses, and manage assets seized from criminal enterprises. They enjoy the widest jurisdiction of any federal law enforcement agency and are involved to some degree in nearly all federal law enforcement efforts. In addition, U.S. marshals pursue and arrest federal fugitives.

U.S. Immigration and Naturalization Service (INS) agents and inspectors facilitate the entry of legal visitors and immigrants to the U.S. and detain and deport those arriving illegally. They consist of border patrol agents, immigration inspectors, criminal investigators and immigration agents, and detention and deportation officers. **U.S. Border Patrol agents** protect more than 8,000 miles of international land and water boundaries. Their missions are to detect and prevent the smuggling and unlawful entry of undocumented foreign nationals into the U.S., apprehend those persons found in violation of the immigration laws, and interdict contraband, such as narcotics. **Immigration inspectors** interview and examine people seeking entrance to the U.S. and its territories. They inspect passports to determine whether people are legally eligible to enter the United States. Immigration inspectors also prepare reports, maintain records, and process applications and petitions for immigration or temporary residence in the United States.

Bureau of Alcohol, Tobacco, Firearms, and Explosives agents regulate and investigate violations of Federal firearms and explosives laws, as well as Federal alcohol and tobacco tax regulations. *Customs agents* investigate violations of narcotics smuggling, money laundering, child pornography, customs fraud, and enforcement of the Arms Export Control Act. Domestic and foreign investigations involve the development and use of informants, physical and electronic surveillance, and examination of records from importers/exporters, banks, couriers, and manufacturers. They conduct interviews, serve on joint task forces with other agencies, and get and execute search warrants.

Customs inspectors inspect cargo, baggage, and articles worn or carried by people and carriers including vessels, vehicles, trains and aircraft entering or leaving the U.S. to enforce laws governing imports and exports. These inspectors examine, count, weigh, gauge, measure, and sample commercial and noncommercial cargoes entering and leaving the United States. Customs inspectors seize prohibited or smuggled articles, intercept contraband, and apprehend, search, detain, and arrest violators of U.S. laws.

U.S. Secret Service special agents protect the President, Vice President, and their immediate families; Presidential candidates; former Presidents; and foreign dignitaries visiting the United States. Secret Service agents also investigate counterfeiting, forgery of Government checks or bonds, and fraudulent use of credit cards.

The U.S. Department of State **Bureau of Diplomatic Security special agents** are engaged in the battle against terrorism. Overseas, they advise ambassadors on all security matters and manage a complex range of security programs designed to protect personnel, facilities, and information. In the U.S., they investigate passport and visa fraud, conduct personnel security investigations, issue security clearances, and protect the Secretary of State and a number of foreign dignitaries. They also train foreign civilian police and administer a counter-terrorism reward program.

Other federal agencies employ police and special agents with sworn arrest powers and the authority to carry firearms. These agencies include the Postal Service, the Bureau of Indian Affairs Office of Law Enforcement, the Forest Service, the National Park Service, and the Federal Air Marshals.

Working Conditions

Police work can be very dangerous and stressful. In addition to the obvious dangers of confrontations with criminals, officers need to be constantly alert and ready to deal appropriately with a number of other threatening situations. Many law enforcement officers witness death and suffering resulting from accidents and criminal behavior. A career in law enforcement may take a toll on officers' private lives.

Uniformed officers, detectives, agents, and inspectors are usually scheduled to work 40-hour weeks, but paid overtime is common. Shift work is necessary because protection must be provided around the clock. Junior officers frequently work weekends, holidays, and nights. Police officers and detectives are required to work at any time their services are needed and may work long hours during investigations. In most jurisdictions, whether on or off duty, officers are expected to be armed and to exercise their arrest authority whenever necessary.

The jobs of some Federal agents such as U.S. Secret Service and DEA special agents require extensive travel, often on very short notice. They may relocate a number of times over the course of their careers. Some special agents in agencies such as the U.S. Border Patrol work outdoors in rugged terrain for long periods and in all kinds of weather.

Employment

Police and detectives held about 840,000 jobs in 2002. About 81 percent were employed by local governments. State police agencies employed about 11 percent and various Federal agencies employed about 6 percent. A small proportion worked for educational services, rail transportation, and contract investigation and security services.

According to the U.S. Bureau of Justice Statistics, police and detectives employed by local governments primarily worked in cities with more than 25,000 inhabitants. Some cities have very large police forces, while thousands of small communities employ fewer than 25 officers each.

Training, Other Qualifications, and Advancement

Civil service regulations govern the appointment of police and detectives in practically all States, large municipalities, and special police agencies, as well as in many smaller ones. Candidates must be U.S. citizens, usually at least 20 years of age, and must meet rigorous physical and personal qualifications. In the Federal Government, candidates must be at least 21 years of age but less than 37 years of age at the time of appointment. Physical examinations for entrance into law enforcement often include tests of vision, hearing, strength, and agility. Eligibility for appointment usually depends on performance in competitive written examinations

and previous education and experience. In larger departments, where the majority of law enforcement jobs are found, applicants usually must have at least a high school education. Federal and State agencies typically require a college degree. Candidates should enjoy working with people and meeting the public.

Because personal characteristics such as honesty, sound judgment, integrity, and a sense of responsibility are especially important in law enforcement, candidates are interviewed by senior officers, and their character traits and backgrounds are investigated. In some agencies, candidates are interviewed by a psychiatrist or a psychologist, or given a personality test. Most applicants are subjected to lie detector examinations or drug testing. Some agencies subject sworn personnel to random drug testing as a condition of continuing employment.

Before their first assignments, officers usually go through a period of training. In State and large local departments, recruits get training in their agency's police academy, often for 12 to 14 weeks. In small agencies, recruits often attend a regional or State academy. Training includes classroom instruction in constitutional law and civil rights, State laws and local ordinances, and accident investigation. Recruits also receive training and supervised experience in patrol, traffic control, use of firearms, self-defense, first aid, and emergency response. Police departments in some large cities hire high school graduates who are still in their teens as police cadets or trainees. They do clerical work and attend classes, usually for 1 to 2 years, at which point they reach the minimum age requirement and may be appointed to the regular force.

Police officers usually become eligible for promotion after a probationary period ranging from 6 months to 3 years. In a large department, promotion may enable an officer to become a detective or specialize in one type of police work, such as working with juveniles. Promotions to corporal, sergeant, lieutenant, and captain usually are made according to a candidate's position on a promotion list, as determined by scores on a written examination and on-the-job performance.

To be considered for appointment as an FBI agent, an applicant either must be a graduate of an accredited law school or a college graduate with a major in accounting, fluency in a foreign language, or 3 years of related full-time work experience. All new agents undergo 16 weeks of training at the FBI academy on the U.S. Marine Corps base in Quantico, Virginia.

Applicants for special agent jobs with the U.S. Secret Service and the Bureau of Alcohol, Tobacco, Firearms, and Explosives must have a bachelor's degree or a minimum of 3 years' related work experience. Prospective special agents undergo 10 weeks of initial criminal investigation training at the Federal Law Enforcement Training Center in Glynco, Georgia, and another 17 weeks of specialized training with their particular agencies.

Applicants for special agent jobs with the U.S. Drug Enforcement Administration (DEA) must have a college degree and either one year of experience conducting criminal investigations, 1 year of graduate school, or have achieved at least a 2.95 grade point average while in college. DEA special agents undergo 14 weeks of specialized training at the FBI Academy in Quantico, Virginia.

U.S. Border Patrol agents must be U.S. citizens, younger than 37 years of age at the time of appointment, possess a valid driver's license, and pass a three-part examination on reasoning and language skills. A bachelor's degree or previous work experience that demonstrates the ability to handle stressful situations, make decisions, and take charge is required for a position as a Border Patrol agent. Applicants may qualify through a combination of education and work experience.

Postal inspectors must have a bachelor's degree and 1 year of related work experience. It is desirable that they have one of several professional certifications, such as that of certified public accountant. They also must pass a background suitability investigation, meet certain health requirements, undergo a drug screening test, possess a valid State driver's license, and be a U.S. citizen between 21 and 36 years of age when hired.

Law enforcement agencies are encouraging applicants to take postsecondary school training in law enforcement-related subjects. Many entry-level applicants for police jobs have completed some formal postsecondary education and a significant number are college graduates. Many junior colleges, colleges, and universities offer programs in law enforcement or administration of justice. Other courses helpful in preparing for a career in law enforcement include accounting, finance, electrical engineering, computer science, and foreign languages. Physical education and sports are helpful in developing the competitiveness, stamina, and agility needed for many law enforcement positions. Knowledge of a foreign language is an asset in many Federal agencies and urban departments.

Continuing training helps police officers, detectives, and special agents improve their job performance. Through police department academies, regional centers for public safety employees established by the States, and Federal agency training centers, instructors provide annual training in self-defense tactics, firearms, use-of-force policies, sensitivity and communications skills, crowd-control techniques, relevant legal developments, and advances in law enforcement equipment. Many agencies pay all or part of the tuition for officers to work toward degrees in criminal justice, police science, administration of justice, or public administration, and pay higher salaries to those who earn such a degree.

Job Outlook

The opportunity for public service through law enforcement work is attractive to many because the job is challenging and involves much personal responsibility. Furthermore, law enforcement officers in many agencies may retire with a pension after 20 or 25 years of service, allowing them to pursue a second career while still in their 40s. Because of relatively attractive salaries and benefits, the number of qualified candidates exceeds the number of job openings in Federal law enforcement agencies and in most State police departments—resulting in increased hiring standards and selectivity by employers. Competition should remain keen for higher paying jobs with State and Federal agencies and police departments in more affluent areas. Opportunities will be better in local and special police departments, especially in departments that offer relatively low salaries, or in urban communities where the crime rate is relatively high. Applicants with college training in police science, military police experience, or both should have the best opportunities.

Employment of police and detectives is expected to grow faster than the average for all occupations through 2012. A more security-conscious society and concern about drug-related crimes should contribute to the increasing demand for police services.

The level of government spending determines the level of employment for police and detectives. The number of job opportunities, therefore, can vary from year to year and from place to place. Layoffs, on the other hand, are rare because retirements enable most staffing cuts to be handled through attrition. Trained law enforcement officers who lose their jobs because of budget cuts usually have little difficulty finding jobs with other agencies. The need to replace workers who retire, transfer to other occupations, or stop working for other reasons will be the source of many job openings.

Earnings

Police and sheriff's patrol officers had median annual earnings of \$42,270 in 2002. The middle 50 percent earned between \$32,300 and \$53,500. The lowest 10 percent earned less than \$25,270, and the highest 10 percent earned more than \$65,330. Median annual earnings were \$47,090 in State government, \$42,020 in local government, and \$41,600 in Federal Government.

In 2002, median annual earnings of police and detective supervisors were \$61,010. The middle 50 percent earned between \$47,210 and \$74,610. The lowest 10 percent earned less than \$36,340, and the highest 10 percent earned more than \$90,070. Median annual earnings were \$78,230 in Federal Government, \$64,410 in State government, and \$59,830 in local government.

In 2002, median annual earnings of detectives and criminal investigators were \$51,410. The middle 50 percent earned between \$39,010 and \$65,980. The lowest 10 percent earned less than \$31,010, and the highest 10 percent earned more than \$80,380. Median annual earnings were \$66,500 in Federal Government, \$47,700 in local government, and \$46,600 in State government.

Federal law provides special salary rates to Federal employees who serve in law enforcement. Additionally, Federal special agents and inspectors receive law enforcement availability pay (LEAP)—equal to 25 percent of the agent's grade and step—awarded because of the large amount of overtime that these agents are expected to work. For example, in 2003 FBI agents enter Federal service as GS-10 employees on the pay scale at a base salary of \$39,115, yet earned about \$48,890 a year with availability pay. They can advance to the GS-13 grade level in field non-supervisory assignments at a base salary of \$61,251, which is worth \$76,560 with availability pay. FBI supervisory, management, and executive positions in grades GS-14 and GS-15 pay a base salary of about \$72,381 or \$85,140 a year, respectively, and equaled \$90,480 or \$106,430 per year including availability pay. Salaries were slightly higher in selected areas where the prevailing local pay level was higher. Because Federal agents may be eligible for a special law enforcement benefits package, applicants should ask their recruiter for more information.

According to the International City-County Management Association's annual Police and Fire Personnel, Salaries, and Expenditures Survey, average salaries for sworn full-time positions in 2002 were as follows:

	Minimum annual base salary	Maximum annual base salary
Police chief	\$68,337	\$87,037
Deputy chief	59,790	75,266
Police captain	56,499	70,177
Police lieutenant	52,446	63,059
Police sergeant	46,805	55,661
Police corporal	39,899	49,299

Total earnings for local, state, and special police and detectives frequently exceed the stated salary because of payments for overtime, which can be significant. In addition to the common benefits—paid vacation, sick leave, and medical and life insurance—most police and sheriffs’ departments provide officers with special allowances for uniforms. Because police officers usually are covered by liberal pension plans, many retire at half-pay after 20 or 25 years of service.

Sources of Additional Information

Information about entrance requirements may be obtained from Federal, State, and local law enforcement agencies and the following agencies:

- Further information about qualifications for employment as a FBI Special Agent is available from the nearest State FBI office. The address and phone number are listed in the local telephone directory. Internet: <http://www.fbi.gov>
- Information on career opportunities, qualifications, and training for U.S. Secret Service Special Agents is available from the Secret Service Personnel Division at (202) 406-5800, (888) 813-8777 or (888) 813-USSS. Internet: <http://www.treas.gov/uss>
- Information about qualifications for employment as a DEA Special Agent is available from the nearest DEA office, or call (800) DEA-4288. Internet: <http://www.usdoj.gov/dea>
- U.S. Marshals Service, Human Resources Division—Law Enforcement Recruiting, Washington, DC 20530-1000. Internet: <http://www.usdoj.gov/marshals>
- U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives Personnel Division, 650 Massachusetts Ave. NW., Room 4100, Washington, DC 20226. Internet: <http://www.atf.treas.gov>
- U.S. Customs and Border Protection, 1300 Pennsylvania Ave., NW., Washington, DC 20229. Internet: <http://www.cbp.gov>

Significant Points

- Most entry-level workers start as helpers or laborers, and several years of training and experience are required to become fully qualified.
- Applicants are expected to encounter keen competition for jobs.
- Opportunities will be best for operators with training in computers and automated equipment.

Nature of the Work

Electricity is vital for most everyday activities. From the moment you flip the first switch each morning, you are connecting to a huge network of people, electric lines, and generating equipment. Power plant operators control the machinery that generates electricity. Power plant distributors and dispatchers control the flow of electricity from the power plant, over a network of transmission lines, to industrial plants and substations, and, finally, over distribution lines to residential users.

Power plant operators control and monitor boilers, turbines, generators, and auxiliary equipment in power-generating plants. Operators distribute power demands among generators, combine the current from several generators, and monitor instruments to maintain voltage and regulate electricity flows from the plant. When power requirements change, these workers start or stop generators and connect or disconnect them from circuits. They often use computers to keep records of switching operations and loads on generators, lines, and transformers. Operators also may use computers to prepare reports of unusual incidents, malfunctioning equipment, or maintenance performed during their shift.

Operators in plants with automated control systems work mainly in a central control room and usually are called **control room operators** and **control room operator trainees or assistants**. In older plants, the controls for the equipment are not centralized, and **switchboard operators** control the flow of electricity from a central point, whereas **auxiliary equipment operators** work throughout the plant, operating and monitoring valves, switches, and gauges.

The Nuclear Regulatory Commission (NRC) licenses operators of nuclear power plants. **Reactor operators** are authorized to control equipment that affects the power of the reactor in a nuclear power plant. In addition, an NRC-licensed **senior reactor operator** must be on duty during each shift to act as the plant supervisor and supervise the operation of all controls in the control room.

Power distributors and dispatchers, also called **load dispatchers or systems operators**, control the flow of electricity through transmission lines to industrial plants and substations that supply residential electric needs. They monitor and operate current converters, voltage transformers, and circuit breakers. Dispatchers also monitor other distribution equipment and record readings at a pilot board—a map of the transmission grid system showing the status of transmission circuits and connections with substations and industrial plants.

Dispatchers also anticipate power needs, such as those caused by changes in the weather. They call control room operators to start or stop boilers and generators, to bring production into balance with needs. Dispatchers handle emergencies such as transformer or transmission line failures and route current around affected areas. In substations, they also operate and monitor equipment that increases or decreases voltage, and they operate switchboard levers to control the flow of electricity in and out of the substations.

Working Conditions

Because electricity is provided around the clock, operators, distributors, and dispatchers usually work one of three daily 8-hour shifts or one of two 12-hour shifts on a rotating basis. Shift assignments may change periodically, so that all operators can share duty on less desirable shifts. Work on rotating shifts can be stressful and fatiguing, because of the constant change in living and sleeping patterns. Operators, distributors, and dispatchers who work in control rooms generally sit or stand at a control station. This work is not physically strenuous, but it does require constant attention. Operators who work outside the control room may be exposed to danger from electric shock, falls, and burns.

Nuclear power plant operators are subject to random drug and alcohol tests, as are most workers at such plants.

Employment

Power plant operators, distributors, and dispatchers held about 51,000 jobs in 2002. Jobs were located throughout the country. About 86 percent of jobs were in utility companies and government agencies that produced electricity. Others worked for manufacturing establishments that produced electricity for their own use.

Training, Other Qualifications, and Advancement

Employers seek high school graduates for entry-level operator, distributor, and dispatcher positions. Candidates with strong mathematics and science skills are preferred. College-level courses or prior experience in a mechanical or technical job may be helpful. With computers now used to keep records, generate reports, and track maintenance, employers are increasingly requiring computer proficiency. Most entry-level workers start as helpers or laborers. Depending on the results of aptitude tests, their own preferences, and the availability of openings, workers may be assigned to train for one of many utility positions.

Workers selected for training as a fossil-fueled power plant operator or distributor undergo extensive on-the-job and classroom instruction. Several years of training and experience are required to become a fully qualified control room operator or power plant distributor. With further training and experience, workers may advance to shift supervisor. Utilities generally promote from within; therefore, opportunities to advance by moving to another employer are limited.

Extensive training and experience are necessary to pass the NRC examinations for reactor operators and senior reactor operators. To maintain their license, licensed reactor operators must pass an annual practical plant operation exam and a biennial

written exam administered by their employers. Training may include simulator and on-the-job training, classroom instruction, and individual study. Entrants to nuclear power plant operator trainee jobs must have strong mathematics and science skills. Experience in other power plants or with Navy nuclear propulsion plants also is helpful. With further training and experience, reactor operators may advance to senior reactor operator positions.

In addition to receiving preliminary training as a power plant operator, distributor, or dispatcher, most workers are given periodic refresher training—frequently in the case of nuclear power plant operators. Refresher training usually is taken on plant simulators designed specifically to replicate procedures and situations that might be encountered at the trainee's plant.

Job Outlook

People who want to become power plant operators, distributors, and dispatchers are expected to encounter keen competition for these high-paying jobs. Declining employment and very low replacement needs in the occupation will result in few job opportunities. The slow pace of construction of new plants also will limit opportunities for power plant operators, distributors, and dispatchers. In addition, the increasing use of automatic controls and more computerized equipment should boost productivity and decrease the demand for operators. As a result, individuals with training in computers and automated equipment will have the best job prospects.

A decline in employment of power plant operators, distributors, and dispatchers is expected through the year 2012, as the utilities industry continues to restructure in response to deregulation and increasing competition. The Energy Policy Act of 1992 continues to have an impact on the organization of the industry. The Act aims at increasing competition in power-generating utilities by allowing independent producers to sell power directly to industrial and other wholesale customers. Consequently, utilities, which historically operated as regulated local monopolies, are restructuring their operations in order to reduce costs and compete effectively; as a result, the number of jobs is decreasing.

Earnings

Median annual earnings of power plant operators were \$49,920 in 2002. The middle 50 percent earned between \$40,090 and \$58,690. The lowest 10 percent earned less than \$31,290, and the highest 10 percent earned more than \$67,950. Median annual earnings of power plant operators in 2002 were \$52,410 in electric power generation, transmission, and distribution and \$44,200 in local government.

Median annual earnings of nuclear power reactor operators were \$61,060 in 2002. The middle 50 percent earned between \$53,060 and \$70,580. The lowest 10 percent earned less than \$48,060, and the highest 10 percent earned more than \$79,880.

Median annual earnings of power distributors and dispatchers were \$54,120 in 2002. The middle 50 percent earned between \$43,750 and \$65,390. The lowest 10 percent earned less than \$34,640, and the highest 10 percent earned more than \$75,420.

Sources of Additional Information

For information about employment opportunities, contact local electric utility companies, locals of unions, and State employment service offices. For general information about power plant operators, nuclear power reactor operators, and power plant distributors and dispatchers, contact:

- American Public Power Association, 2301 M St. NW., Washington, DC 20037-1484. Internet: <http://www.appanet.org>
- International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, DC 20005.

Carpet and Tile Installers

[Return to Menu](#)

Significant Points

- Forty-three percent of all carpet, floor, and tile installers and finishers are self-employed, compared with 19 percent of all construction trades workers.
- Most workers learn on the job.
- Carpet installers, the largest specialty, should have the best job opportunities.
- The employment of carpet, floor, and tile installers and finishers is less sensitive to fluctuations in construction activity than that of other construction trades workers.

Nature of the Work

Carpet, tile, and other types of floor coverings not only serve an important basic function in buildings, but their decorative qualities also contribute to the appeal of the buildings. Carpet, floor, and tile installers and finishers lay these floor coverings in homes, offices, hospitals, stores, restaurants, and many other types of buildings. Tile also is installed on walls and ceilings.

Before installing carpet, **carpet installers** first inspect the surface to be covered to determine its condition and, if necessary, correct any imperfections that could show through the carpet or cause the carpet to wear unevenly. They must measure the area to be carpeted and plan the layout, keeping in mind expected traffic patterns and placement of seams for best appearance and maximum wear.

When installing wall-to-wall carpet without tacks, installers first fasten a tackless strip to the floor, next to the wall. They then install the padded cushion or underlay. Next, they roll out, measure, mark, and cut the carpet, allowing for 2 to 3 inches of extra carpet for the final fitting. Using a device called a "knee kicker," they position the carpet, stretching it to fit evenly on the floor and snugly against each wall and door threshold. They then cut off the excess carpet. Finally, using a power stretcher, they stretch the carpet, hooking it to the tackless strip to hold it in place. The installers then finish the edges using a wall trimmer.

Because most carpet comes in 12-foot widths, wall-to-wall installations require installers to join carpet sections together for large rooms. The installers join the sections using heat-taped seams—seams held together by a special plastic tape that is activated by heat.

On special upholstery work, such as stairs, carpet may be held in place with staples. In addition, in commercial installations, carpet often is glued directly to the floor or to padding that has been glued to the floor.

Carpet installers use hand tools such as hammers, drills, staple guns, carpet knives, and rubber mallets. They also may use carpet laying tools, such as carpet shears, knee kickers, wall trimmers, loop pile cutters, heat irons, and power stretchers.

Floor installers, or floor layers, apply blocks, strips, or sheets of shock-absorbing, sound-deadening, or decorative coverings to floors and cabinets using rollers, knives, trowels, sanding machines, and other tools. Some floor covering materials are designed to be purely decorative. Others have more specialized purposes, such as to deaden sound, to absorb shocks, or to create airtight environments. Before installing the floor, floor layers inspect the surface to be covered and, if necessary, correct any imperfections in order to start with a smooth, clean foundation. They measure and cut floor covering materials, such as rubber, vinyl, linoleum, or cork, and any foundation material, such as felt, according to designated blueprints. Next, they may nail or staple a wood underlayment to the surface or may use an adhesive to cement the foundation material to the floor; the foundation helps to deaden sound and prevents the top floor covering from wearing at board joints. Finally, floor layers install the top covering. They join sections of sheet covering by overlapping adjoining edges and cutting through both layers with a knife to form a tight joint.

Floor sanders and finishers scrape and sand wooden floors to smooth surfaces using floor-sanding machines. They then inspect the floor for smoothness and remove excess glue from joints using a knife or wood chisel and may sand wood surfaces by hand, using sandpaper. Finally, they apply coats of finish.

Tile installers, tile setters, and marble setters apply hard tile and marble to floors, walls, ceilings, and roof decks. Tile is durable, impervious to water, and easy to clean, making it a popular building material in hospitals, tunnels, lobbies of buildings, bathrooms, and kitchens.

Prior to installation, tile setters use measuring devices and levels to ensure that the tile is placed in a consistent manner. To set tile, which generally ranges in size from 1 inch to 12 or more inches square, tile setters use cement or “mastic,” a very sticky paste. When using cement, tile setters nail a support of metal mesh to the wall or ceiling to be tiled. They use a trowel to apply a cement mortar—called a “scratch coat”—onto the metal screen, and scratch the surface of the soft mortar with a small tool similar to a rake. After the scratch coat has dried, tile setters apply another coat of mortar to level the surface, and then apply mortar to the back of the tile and place it onto the surface.

To set tile in mastic or a cement adhesive, called “thin set,” tile setters need a flat, solid surface such as drywall, concrete, plaster, or wood. They use a tooth-edged trowel to spread mastic on the surface or apply cement adhesive, and then properly position the tile.

Because tile varies in color, shape, and size, workers sometimes prearrange tiles on a dry floor according to a specified design. This allows workers to examine the pattern and make changes. In order to cover all exposed areas, including corners and around pipes, tubs, and washbasins, tile setters cut tiles to fit with a machine saw or a special cutting tool. Once the tile is placed, they gently tap the surface with their trowel handle or a small block of wood to seat the tile evenly.

When the cement or mastic has set, tile setters fill the joints with “grout,” which is very fine cement. They then scrape the surface with a rubber-edged device called a grout float or a grouting trowel to dress the joints and remove excess grout. Before the grout sets, they finish the joints with a damp sponge for a uniform appearance. Marble setters cut and set marble slabs in floors and walls of buildings. They trim and cut marble to specified size using a power wet saw, other cutting equipment, or hand tools. After setting the marble in place, they polish the marble to high luster using power tools or by hand.

Working Conditions

Carpet, floor, and tile installers and finishers generally work indoors and have regular daytime hours. However, when floor covering installers work in occupied stores or offices, they may work evenings and weekends to avoid disturbing customers or employees. Installers and finishers usually work under better conditions than do most other construction workers. By the time workers install carpets, flooring, or tile in a new structure, most construction has been completed and the work area is relatively clean and uncluttered. Installing these materials is labor intensive; workers spend much of their time bending, kneeling, and reaching—activities that require endurance. Carpet installers frequently lift heavy rolls of carpet and may move heavy furniture. Safety regulations may require that they wear kneepads or safety goggles when using certain tools. Carpet and floor layers may be exposed to fumes from various kinds of glue and to fibers of certain types of carpet.

Although workers are subject to cuts from tools or materials, falls from ladders, and strained muscles, the occupation is not as hazardous as some other construction occupations.

Employment

Carpet, floor, and tile installers and finishers held about 164,000 jobs in 2002. Forty-three percent of all carpet, floor, and tile installers and finishers were self-employed, compared with 19 percent of all construction trades workers. The following tabulation shows 2002 wage and salary employment by specialty.

Carpet installers	82,000
Tile and marble setters	33,000
Floor layers, except carpet, wood, and hard tiles	31,000
Floor sanders and finishers	17,000

Many carpet installers worked for flooring contractors or floor covering retailers. Most salaried tile setters were employed by tile setting contractors who work mainly on

nonresidential construction projects, such as schools, hospitals, and office buildings. Most self-employed tile setters work on residential projects.

Although carpet, floor, and tile installers and finishers are employed throughout the Nation, they tend to be concentrated in populated areas where there are high levels of construction activity.

Training, Other Qualifications and Advancement

The vast majority of carpet, floor, and tile installers and finishers learn their trade informally, on the job, as helpers to experienced workers. Others learn through formal apprenticeship programs, which include on-the-job training as well as related classroom instruction.

Informal training for carpet installers often is sponsored by individual contractors. Workers start as helpers, and begin with simple assignments, such as installing stripping and padding, or helping to stretch newly installed carpet. With experience, helpers take on more difficult assignments, such as measuring, cutting, and fitting.

Persons who wish to begin a career in carpet installation as a helper or apprentice should be at least 18 years old and have good manual dexterity. Many employers prefer applicants with a high school diploma; courses in general mathematics and shop are helpful. Some employers may require a driver's license and a criminal background check. Because carpet installers frequently deal directly with customers, they should be courteous and tactful.

Many tile and floor layers learn their job through on-the-job training and begin by learning about the tools of the trade. They next learn to prepare surfaces to receive flooring. As they progress, tile setters, marble setters, and floor layers learn to cut and install tile, marble, and floor coverings. Tile and marble setters also learn to apply grout and to do finishing work.

Apprenticeship programs and some contractor-sponsored programs provide comprehensive training in all phases of the tiling and floor layer trades. Most apprenticeship programs are union-sponsored and consist of weekly classes and on-the-job training usually lasting 3 to 4 years.

When hiring apprentices or helpers for floor layer and tilesetter jobs, employers usually prefer high school graduates who have had courses in general mathematics, mechanical drawing, and shop. Good physical condition, manual dexterity, and a good sense of color harmony also are important assets.

Carpet, floor, and tile installers and finishers may advance to positions as supervisors or become salespersons or estimators. Some carpet installers may become managers for large installation firms. Many carpet, floor, and tile installers and finishers who begin working for a large contractor eventually go into business for themselves as independent subcontractors.

Job Outlook

Employment of carpet, floor, and tile installers and finishers is expected to grow about as fast as the average for all occupations through the year 2012, reflecting the continued need to renovate and refurbish existing structures. However, employment of one specialty—floor sanders and finishers—is projected to grow more slowly than average due to the increasing use of prefinished hardwood and similar flooring. Carpet installers, the largest specialty, should have the best job opportunities.

Carpet as a floor covering continues to be popular and its use is expected to grow in structures such as schools, offices, hospitals, and industrial plants. Employment of carpet installers also is expected to grow because wall-to-wall carpeting is a necessity in the many houses built with plywood, rather than hardwood, floors. Similarly, offices, hotels, and stores often cover concrete floors with wall-to-wall carpet, which must be periodically replaced.

Demand for tile and marble setters will stem from population and business growth, which should result in more construction of shopping malls, hospitals, schools, restaurants, and other structures in which tile is used extensively. Tile is expected to continue to increase in popularity as a building material and to be used more extensively, particularly in the growing number of more expensive homes, leading to faster than average growth for tile and marble setters. Demand for floor layers and sanders and finishers will expand as a result of growth in construction activity, particularly that related to residential homes and commercial buildings, and as some people decide to replace their plywood floors with hardwood floors. Job opportunities for tile and marble setters and for floor layers and sanders, relatively small specialties, will not be as plentiful as those for carpet installers.

The employment of carpet, floor, and tile installers and finishers is less sensitive to changes in construction activity than is that of most other construction occupations because much of the work involves replacing carpet and other flooring in existing buildings. As a result, these workers tend to be sheltered from the business fluctuations that often occur in new construction activity.

Earnings

In 2002, the median hourly earnings of carpet installers were \$15.67. The middle 50 percent earned between \$11.39 and \$21.03. The lowest 10 percent earned less than \$8.90, and the top 10 percent earned more than \$27.15. In 2002, median hourly earnings of carpet installers working for building finishing contractors were \$16.09, and in home furnishings stores, \$14.64.

Carpet installers are paid either on an hourly basis, or by the number of yards of carpet installed. The rates vary widely depending on the geographic location and whether the installer is affiliated with a union.

Median hourly earnings of floor layers were \$16.15 in 2002. The middle 50 percent earned between \$11.42 and \$20.81. The lowest 10 percent earned less than \$8.58, and the top 10 percent earned more than \$26.87.

Median hourly earnings of floor sanders and finishers were \$13.22 in 2002. The middle 50 percent earned between \$10.38 and \$16.97. The lowest 10 percent earned less than \$8.96, and the top 10 percent earned more than \$22.51.

Median hourly earnings of tile and marble setters were \$17.20 in 2002. The middle 50 percent earned between \$12.96 and \$22.39. The lowest 10 percent earned less than \$10.21, and the top 10 percent earned more than \$28.22. Earnings of tile and marble setters also vary greatly by geographic location and by union membership status.

Apprentices and other trainees usually start out earning about half of what an experienced worker earns, although their wage rate increases as they advance through the training program.

Some carpet, floor, and tile installers and finishers belong to the United Brotherhood of Carpenters and Joiners of America. Some tile setters belong to the International Union of Bricklayers and Allied Craftsmen, while some carpet installers belong to the International Brotherhood of Painters and Allied Trades.

Sources of Additional Information

For details about apprenticeships or work opportunities, contact local flooring or tile setting contractors or retailers, locals of the unions previously mentioned, or the nearest office of the State apprenticeship agency or employment service.

- Floor Covering Installation Contractors Association, 7439 Milwood Dr., West Bloomfield, MI 48322.
- International Union of Painters and Allied Trades, 1750 New York Ave. NW., Washington, DC 20006. Internet: <http://www.iupat.org>
- International Union of Bricklayers and Allied Craftworkers, 1776 I St. NW., Washington, DC. 20006.
- International Masonry Institute, James Brice House, 42 East St. Annapolis, MD 21401. Internet: <http://www.imiweb.org>
- Home Builders Institute, 1201 15th St. NW., Washington, DC 20005. Internet: <http://www.hbi.org>
- National Association of Home Builders, 1201 15th St. NW., Washington, DC 20005. Internet: <http://www.nahb.org>
- National Tile Contractors Association, P.O. Box 13629, Jackson MS 39236.
- United Brotherhood of Carpenters and Joiners of America, 50 F St. NW., Washington, DC 20001. Internet: <http://www.carpenters.org>

There are more than 500 occupations registered by the U.S. Department of Labor's National Apprenticeship system. For more information on the Labor Department's registered apprenticeship system and links to State apprenticeship programs, check the Internet site: <http://www.doleta.gov>

- Line installers and repairers work outdoors; conditions can be hazardous.
- Line installers and repairers are trained on the job; employers prefer applicants with a technical knowledge of electricity and electronics.
- Employment is expected to grow about as fast as average.
- Earnings are higher than in most other occupations that do not require postsecondary education.

Nature of the Work

Vast networks of wires and cables provide customers with electrical power and communications services. Networks of electrical power lines deliver electricity from generating plants to customers. Communications networks of telephone and cable television lines provide voice, video, and other communications services. These networks are constructed and maintained by line installers and repairers.

Line installers, or line erectors, install new lines by constructing utility poles, towers, and underground trenches to carry the wires and cables. Line erectors use a variety of construction equipment, including digger derricks, trenchers, cable plows, and borers. Digger derricks are trucks equipped with augers and cranes; workers use augers to dig holes in the ground, and cranes are used to set utility poles in place. Trenchers and cable plows are used to cut openings in the earth for the laying of underground cables. Borers, which tunnel under the earth, are used to install tubes for the wire without opening a trench in the soil.

When construction is complete, line installers string cable along the poles, towers, tunnels, and trenches. While working on poles and towers, installers first use truck-mounted buckets to reach the top of the structure or physically climb the pole or tower. Next, they pull up cable from large reels mounted on trucks. The line is then set in place and pulled so that it has the correct amount of tension. Finally, line installers attach the cable to the structure using hand and hydraulic tools. When working with electrical power lines, installers bolt or clamp insulators onto the poles before attaching the cable. Underground cable is laid directly in a trench, pulled through a tunnel, or strung through a conduit running through a trench.

Other installation duties include setting up service for customers and installing network equipment. To set up service, line installers string cable between the customers' premises and the lines running on poles or towers or in trenches. They install wiring to houses and check the connection for proper voltage readings. Line installers also may install a variety of equipment. Workers on telephone and cable television lines install amplifiers and repeaters that maintain the strength of communications transmissions. Workers on electrical power lines install and replace transformers, circuit breakers, switches, fuses, and other equipment to control and direct the electrical current.

In addition to installation, line installers and repairers also are responsible for maintenance of electrical, telecommunications, and cable television lines. Workers periodically travel in trucks, helicopters, and airplanes to visually inspect the wires and cables. Sensitive monitoring equipment can automatically detect malfunctions on

the network, such as loss of current flow. When line repairers identify a problem, they travel to the location of the malfunction and repair or replace defective cables or equipment. Bad weather or natural disasters can cause extensive damage to networks. Line installers and repairers must respond quickly to these emergencies to restore critical utility and communications services. This can often involve working outdoors in adverse weather conditions.

Installation and repair work may require splicing, or joining together, separate pieces of cable. Each cable contains numerous individual wires; splicing the cables together requires that each wire in one piece of cable be joined to another wire in the matching piece. Line installers splice cables using small hand tools, epoxy, or mechanical equipment. At each splice, they place insulation over the conductor and seal the splice with moisture proof covering.

Many communications networks now use fiber optic cables instead of conventional wire or metal cables. Fiber optic cables are made of hair-thin strands of glass, which convey pulses of light. These cables can carry much more information at higher speeds than can conventional cables. The higher transmission capacity of fiber optic cable has allowed communication networks to offer upgraded services, such as high-speed Internet access. Splicing fiber optic cable requires specialized equipment that carefully slices, matches, and aligns individual glass fibers. The fibers are joined by either electrical fusion (welding) or a mechanical fixture and gel (glue).

Working Conditions

Line installers and repairers must climb and maintain their balance while working on poles and towers. They lift equipment and work in a variety of positions, such as stooping or kneeling. Their work often requires that they drive utility vehicles, travel long distances, and work outdoors under a variety of weather conditions. Many line installers and repairers work a 40-hour week; however, emergencies may require overtime work. For example, when severe weather damages electrical and communications lines, line installers and repairers may work long and irregular hours to restore service.

Line installers and repairers encounter serious hazards on their jobs and must follow safety procedures to minimize potential danger. They wear safety equipment when entering utility holes and test for the presence of gas before going underground. Electric power line workers have the most hazardous jobs. High-voltage power lines can cause electrocution, and line installers and repairers must consequently use electrically insulated protective devices and tools when working with live cables. Power lines are typically higher than telephone and cable television lines, increasing the risk of severe injury due to falls. To prevent these injuries, line installers and repairers must use fall-protection equipment when working on poles or towers.

Employment

Line installers and repairers held about 268,000 jobs in 2002. Approximately 167,000 were telecommunications line installers and repairers; the remainder were electrical power line installers and repairers. Nearly all line installers and repairers worked for telecommunications, construction or electric power generation, transmission, and distributions companies. Approximately 9,300 line installers and repairers were self-employed.

Training, Other Qualifications, and Advancement

Line installers and repairers are trained on the job, and employers require at least a high school diploma. Employers also prefer a technical knowledge of electricity, electronics, and experience obtained through vocational/technical programs, community colleges, or the Armed Forces. Prospective employees should possess a basic knowledge of algebra and trigonometry, and mechanical ability. Customer service and interpersonal skills also are important. Because the work entails lifting heavy objects (many employers require applicants to be able to lift at least 50 pounds), climbing, and other physical activity, applicants should have stamina, strength, and coordination, and must be unafraid of heights. The ability to distinguish colors is necessary because wires and cables may be color-coded.

Many community or technical colleges offer programs in telecommunications, electronics, and/or electricity. These programs often are operated with assistance from local employers and unions. Some schools, working with local companies, offer 1-year certificate programs that emphasize hands-on field work; graduates get preferential treatment in the hiring process at companies participating in the program. More advanced 2-year associate degree programs provide students with a broader knowledge of telecommunications and electrical utilities technology through courses in electricity, electronics, fiber optics, and microwave transmission.

Electrical line installers and repairers complete formal apprenticeships or employer training programs. These are sometimes administered jointly by the employer and the union representing the workers. The unions include the International Brotherhood of Electrical Workers, the Communications Workers of America, and the Utility Workers Union of America. Apprenticeship programs last up to 5 years and combine formal instruction with on-the-job training. Government safety regulations strictly define the training and education requirements for apprentice electrical line installers.

Line installers and repairers in telephone and cable television companies receive several years of on-the-job training. They also may attend training or take online courses provided by equipment manufacturers, schools, unions, or industry training organizations. The Society of Cable Television Engineers (SCTE) provides certification programs for line installers and repairers. Applicants for certification must be employed in the cable television industry and attend training sessions at local SCTE chapters.

Entry-level line installers may be hired as ground workers, helpers, or tree trimmers, who clear branches from telephone and power lines. These workers may advance to positions stringing cable and performing service installations. With experience, they may advance to more sophisticated maintenance and repair positions responsible for increasingly larger portions of the network. Promotion to supervisory or training positions also is possible, but more advanced supervisory positions often require a college diploma.

Job Outlook

Overall employment of line installers and repairers is expected to grow about as fast as the average for all occupations through 2012. Much of this increase will result from growth in the construction and telecommunications industries. With the

increasing competition in electrical distribution, many companies are contracting out construction of new lines. The introduction of new technologies, especially fiber optic cable, has increased the transmission capacity of telephone and cable television networks. This higher capacity has allowed the creation of new and popular services, such as high-speed Internet access. At the same time, deregulation of the telecommunications industry has reduced barriers to competition. Competition for local phone service and demand for high-speed Internet access is forcing former local telephone companies to update and modernize their networks. In some regions, underground telephone lines may be up to 50 years old and incapable of providing advanced services. Job growth also will stem from the maintenance and modernization of telecommunications networks. Besides those due to employment growth, many job openings will result from the need to replace the large number of older workers reaching retirement age.

Employment of telecommunications line installers and repairers is expected to grow about as fast as average as telephone and cable television companies expand and improve networks that provide customers with high-speed access to data, video, and graphics. Line installers and repairers will be needed not only to construct and install networks, but also to maintain the ever-growing systems of wires and cables. The average residential customer already has more than two telephone lines. Increased demand for high-speed Internet access and multiple telephone lines will require the improvement and expansion of local telephone-line networks. However, excess transmission capacity due to the overexpansion of fiber optic lines, especially long-distance lines, in recent years should significantly reduce employment demand. The need for maintenance work will be reduced by the improved reliability of fiber optic lines. The demand for additional telephone lines also will be tempered by the increasing use of wireless telephones. Wireless networks do not require as many technicians to maintain and expand their systems, a characteristic that will reduce job growth in the industry.

Little or no growth in employment of electrical power line installers and repairers is expected through 2012. The demand for electricity has been consistently rising, driving the expansion of power line networks, which tends to increase employment. However, industry deregulation is pushing companies to cut costs and maintenance, which tends to reduce employment. Most new jobs are expected to arise in the construction industry. Because electrical power companies have reduced hiring and training in past years, opportunities are best for workers who possess experience and training.

Earnings

Earnings for line installers and repairers are higher than those in most other occupations that do not require postsecondary education. Median hourly earnings for electrical power line installers and repairers were \$23.33 in 2002. The middle 50 percent earned between \$18.02 and \$27.43. The lowest 10 percent earned less than \$13.22, and the highest 10 percent earned more than \$32.08. Median hourly earnings in the industries employing the largest numbers of electrical power line installers and repairers in 2002 are shown below.

Electric power generation, transmission / distribution	\$24.72
Wired telecommunications carriers	23.80
Local government	22.07
Utility system construction	17.22
Building equipment contractors	16.27

Median hourly earnings for telecommunications line installers and repairers were \$19.06 in 2002. The middle 50 percent earned between \$13.36 and \$24.70. The lowest 10 percent earned less than \$10.31, and the highest 10 percent earned more than \$27.70. Median hourly earnings in the industries employing the largest numbers of telephone and cable television line installers and repairers in 2002 are shown below.

Wired telecommunications carriers	\$24.20
Cable and other subscription programming	18.48
Cable and other program distribution	15.01
Building equipment contractors	15.00
Utility system construction	13.58

Most line installers and repairers belong to unions, principally the Communications Workers of America, the International Brotherhood of Electrical Workers, and the Utility Workers Union of America. For these workers, union contracts set wage rates, wage increases, and the time needed to advance from one job level to the next.

Sources of Additional Information

For more details about employment opportunities, contact the telephone, cable television, or electrical power companies in your community. For general information and some educational resources on line installer and repairer jobs, write to:

- Communications Workers of America, 501 3rd St. NW., Washington, DC 20001.
- International Brotherhood of Electrical Workers, Telecommunications Department, 1125 15th St. NW., Washington, DC 20005.
- Society of Cable Telecommunications Engineers, Certification Department, 140 Phillips Rd., Exton, PA 19341-1318. Internet: <http://www.scte.org>

Significant Points

- Most workers begin as yard laborers, and later may have the opportunity to train for engineer or conductor jobs.
- Employment of most rail transportation occupations is expected to decline; however, employment of subway and streetcar operators will have average growth.
- Competition for available job opportunities is expected to be keen.
- Nearly 3 out of 4 workers are members of unions, and earnings are relatively high.

Nature of the Work

More than a century ago, freight and passenger railroads were the ties binding the Nation together and the engine driving the economy. Today, rail transportation remains a vital link in our Nation's transportation network and economy. Railroads deliver billions of tons of freight and thousands of travelers to destinations throughout the Nation, while subways and light-rail systems transport millions of passengers within metropolitan areas.

Locomotive engineers are among the most experienced and skilled workers on the railroad. Locomotive engineers operate large trains carrying cargo and passengers between stations. Most engineers run diesel locomotives, while a few operate electrically powered locomotives.

Before and after each run, engineers check the mechanical condition of their locomotive and make minor adjustments on the spot. Engineers receive starting instructions from conductors and move controls such as throttles and airbrakes to drive the locomotive. They monitor gauges and meters that measure speed, amperage, battery charge, and air pressure, both in the brake lines and in the main reservoir.

On the open rail and in the yard, engineers confer with conductors and traffic control center personnel via two-way radio or mobile telephone to issue or receive information concerning stops, delays, and train locations. They interpret and comply with orders, signals, speed limits, and railroad rules and regulations. They must have a thorough knowledge of the signaling systems, yards, and terminals on routes over which they operate. Engineers must be constantly aware of the condition and makeup of their train, because trains react differently to acceleration, braking, and curves, depending on the grade and condition of the rail, the number of cars, the ratio of empty to loaded cars, and the amount of slack in the train.

Rail yard engineers, dinkey operators, and hostlers drive switching or small "dinkey" engines within railroad yards, industrial plants, mines and quarries, or construction projects.

Railroad conductors coordinate the activities of freight and passenger train crews. Railroad conductors assigned to freight trains review schedules, switching orders,

waybills, and shipping records to obtain loading and unloading information regarding their cargo. Conductors assigned to passenger trains also ensure passenger safety and comfort as they go about collecting tickets and fares, making announcements for the benefit of passengers, and coordinating activities of the crew to provide passenger services.

Before a train leaves the terminal, the conductor and engineer discuss instructions received from the dispatcher concerning the train's route, timetable, and cargo. During the run, conductors use two-way radios and mobile telephones to communicate with dispatchers, engineers, and conductors of other trains. Conductors use dispatch or electronic monitoring devices that relay information about equipment problems on the train or the rail. They may arrange for the removal of defective cars from the train for repairs at the nearest station or stop. In addition, conductors may discuss alternative routes if there is a defect or obstruction on the rail.

Yardmasters coordinate activities of workers engaged in railroad traffic operations. These activities include making up or breaking up trains and switching inbound or outbound traffic to a specific section of the line. Some cars are sent to unload their cargo on special tracks, while other cars are moved to other tracks to await assemblage into new trains destined for different cities. Yardmasters inform engineers where to move the cars to fit the planned train configuration. Switches, many of them operated remotely by computer, divert the locomotive or cars to the proper track for coupling and uncoupling.

Railroad brake, signal, and switch operators perform a variety of activities, such as operating track switches to route cars to different sections of the yard. They may signal engineers and set warning signals, help to couple and uncouple rolling stock to make up or break up trains, or inspect couplings, airhoses, and handbrakes.

Traditionally, freight train crews included either one or two brake operators—one in the locomotive with the engineer and another who rode with the conductor in the rear car. Brake operators worked under the direction of conductors and did the physical work involved in adding and removing cars at railroad stations and assembling and disassembling trains in railroad yards. In an effort to reduce costs and take advantage of new technology, most railroads have phased out brake operators. Many modern freight trains use only an engineer and a conductor, stationed with the engineer, because new visual instrumentation and monitoring devices have eliminated the need for crewmembers located at the rear of the train.

In contrast to other rail transportation workers, subway and streetcar operators generally work for public transit authorities instead of railroads. *Subway operators* control trains that transport passengers throughout a city and its suburbs. The trains run in underground tunnels, on the surface, or on elevated tracks. Operators must stay alert to observe signals along the track that indicate when they must start, slow, or stop their train. They also make announcements to riders, may open and close the doors of the train, and ensure that passengers get on and off the subway safely.

To meet predetermined schedules, operators must control the train's speed and the amount of time spent at each station. Increasingly, however, these functions are controlled by computers and not by the operator. When breakdowns or emergencies

occur, operators contact their dispatcher or supervisor and may have to evacuate cars.

Streetcar operators drive electric-powered streetcars, trolleys, or light-rail vehicles that are similar to streetcars that transport passengers in metropolitan areas. Some tracks may be recessed in city streets or have grade crossings, so operators must observe traffic signals and cope with car and truck traffic. Operators start, slow, and stop their cars so that passengers may get on and off with ease. Operators may collect fares and issue change and transfers. They also answer questions from passengers concerning fares, schedules, and routes.

Working Conditions

Many rail transportation employees work nights, weekends, and holidays because trains operate 24 hours a day, 7 days a week. Many work more than a 40-hour workweek. Seniority usually dictates who receives the more desirable shifts.

Most freight trains are unscheduled, and few workers on these trains have scheduled assignments. Instead, workers place their names on a list and wait for their turn to work. Jobs usually are assigned on short notice and often at odd hours. Those who work on trains operating between points hundreds of miles apart may spend several nights at a time away from home.

Workers on passenger trains ordinarily have regular and reliable shifts. Also, the appearance, temperature, and accommodations of passenger trains are more comfortable than those of freight trains.

Rail yard workers spend most of their time outdoors in varying weather. The work of conductors and engineers on local runs, on which trains frequently stop at stations to pick up and deliver cars, is physically demanding. Climbing up and down and getting off moving cars is strenuous and can be dangerous.

Employment

Rail transportation workers held 101,000 jobs in 2002, distributed among the detailed occupations as follows:

Railroad conductors and yardmasters	38,000
Locomotive engineers and firers	33,000
Railroad brake, signal, and switch operators	15,000
Subway, streetcar operators and all other rail transportation workers	15,000

Most rail transportation workers are employed in either the rail transportation industry or support activities for the industry. The rest work primarily for local governments as subway and streetcar operators and for mining and manufacturing establishments who operate their own locomotives and engines to move railcars containing ore, coal, and other bulk materials.

Training, Other Qualifications, and Advancement

Most railroad transportation workers begin as yard laborers and later may have the opportunity to train for engineer or conductor jobs. Railroads require that applicants have a minimum of a high school diploma or its equivalent. Applicants must have good hearing, eyesight, and color vision, as well as good hand-eye coordination, manual dexterity, and mechanical aptitude. Physical stamina is required for these entry-level jobs. Employers require railroad transportation job applicants to pass a physical examination, drug and alcohol screening, and a criminal background check. Under Federal law, all train crewmembers are subject to random drug and alcohol testing while on duty.

Applicants for locomotive engineer jobs must be at least 21 years old. Employers almost always fill engineer positions with workers who have experience in other railroad-operating occupations. Federal regulations require beginning engineers to complete a formal engineer training program, including classroom, simulator, and hands-on instruction in locomotive operation. The instruction usually is administered by the rail company in programs approved by the Federal Railroad Administration. At the end of the training period, engineers must pass a hearing and visual acuity test, a safety conduct background check, a railroad operation knowledge test, and a skills performance test. The company issues the engineer a license after the applicant passes the examinations. Other conditions and rules may apply to entry-level engineers and usually vary by employer.

To maintain certification, railroad companies must monitor their engineers. In addition, engineers must periodically pass an operational rules efficiency test. The test is an unannounced event requiring engineers to take active or responsive action in certain situations, such as maintaining a particular speed through a curve or yard.

Engineers undergo periodic physical examinations and drug and alcohol testing to determine their fitness to operate locomotives. In some cases, engineers who fail to meet these physical and conduct standards are restricted to yard service; in other instances, they may be disciplined, trained to perform other work, or discharged.

Conductor jobs generally are filled from the ranks of experienced rail transportation workers who have passed tests covering signals, timetables, operating rules, and related subjects. Seniority usually is the main factor in determining promotion to conductor. Entry-level conductors must generally be at least 21 years of age and are either trained by their employers or required to complete a formal conductor training program through a community college.

Newly trained engineers and conductors are placed on the "extra board" until permanent positions become available. Extra-board workers receive assignments only when the railroad needs substitutes for regular workers who are absent because of vacation, illness, or other personal reasons. Seniority rules may allow workers with greater seniority to select their type of assignment. For example, an engineer may move from an initial regular assignment in yard service to road service.

For subway and streetcar operator jobs, subway transit systems prefer applicants with a high school education. Most transit systems that operate subways and streetcars also operate buses. In these systems, subway or streetcar operators usually must start as bus drivers. Applicants also must be in good health, have good

communication skills, and be able to make quick, responsible judgments. New operators generally complete training programs that last from a few weeks to 6 months. At the end of the period of classroom and on-the-job training, operators usually must pass qualifying examinations covering the operating system, troubleshooting, and evacuation and emergency procedures. Some operators with sufficient seniority can advance to station manager or other supervisory positions.

Job Outlook

Competition for available job opportunities is expected to be keen. Many persons qualify for rail transportation occupations because education beyond high school generally is not required. Rail transportation occupations attract more applicants than the number of available job openings, because the pay is good and the work is steady.

Employment of most railroad transportation occupations is expected to decline through the year 2012. The need to replace workers who transfer to other occupations or retire will be the main source of job openings. Employment in most rail occupations will continue to decline as both railroads and job duties are consolidated. Locomotive engineers and conductors will increasingly take on the job duties of other workers as railroads control labor costs to remain competitive with other modes of transportation. However, employment of subway and streetcar operators will grow about as fast as the average for all occupations, due to increased demand for light-rail transportation systems around the Nation.

Demand for railroad freight service will grow as the economy and the intermodal transportation of goods expand. Intermodal systems use trucks to pick up and deliver the shippers' sealed trailers or containers and employ trains to transport them long distance. This practice saves customers time and money because it carries goods across the country efficiently. For railroads, the benefit has been an increase in the efficiency of equipment use, allowing each train to make more runs each year. In order to compete with other modes of transportation, such as trucks, ships, and aircraft, railroads are improving delivery times and ontime service while reducing shipping rates.

However, growth in the number of railroad transportation workers will be adversely affected by innovations such as larger, faster, more fuel-efficient trains and computerized classification yards that make it possible to move freight more economically. Computers help to keep track of freight cars, match empty cars with the closest loads, and dispatch trains. Computer-assisted devices alert engineers to malfunctions, and work rules now allow trains to operate with two-person crews instead of the traditional three- to five-person crews.

Earnings

Median hourly earnings of rail transportation occupations in 2002 were relatively high, as indicated by the following tabulation:

Locomotive engineers and locomotive firers	\$23.26
Subway and streetcar operators and all other rail transportation workers	21.48
Railroad conductors and yardmasters	21.39
Railroad brake, signal, and switch operators	20.93

Most railroad workers are paid according to miles traveled or hours worked, whichever leads to higher earnings. Full-time employees have steadier work, more regular hours, increased opportunities for overtime work, and higher earnings than do those assigned to the extra board.

Almost three-quarters of railroad transportation workers are members of unions. Many different railroad unions represent various crafts on the railroads. Most railroad engineers are members of the Brotherhood of Locomotive Engineers, while most other railroad transportation workers are members of the United Transportation Union. Many subway operators are members of the Amalgamated Transit Union, while others belong to the Transport Workers Union of North America.

Sources of Additional Information

To obtain information on employment opportunities, contact the employment offices of the various railroads and rail transit systems, or State employment service offices. For general information about the rail transportation industry, contact either of the following organizations:

- Association of American Railroads, 50 F St. NW., Washington, DC 20001. Internet: <http://www.aar.org>
- Federal Railroad Administration, 1120 Vermont Ave. NW., Washington, DC 20590. Internet: <http://www.fra.dot.gov>
- American Public Transportation Association, 1666 K St. NW., Suite 1100, Washington, DC 20006.
- Brotherhood of Locomotive Engineers, 1370 Ontario Ave., Cleveland, OH 44113-1702. Internet: <http://www.ble.org>

Significant Points

- Real estate brokers and sales agents often work evenings and weekends and usually are on call to suit the needs of clients.
- A license is required in every State and the District of Columbia.
- Although gaining a job as a real estate agent or broker may be relatively easy, beginning agents and brokers may face competition from well-established, more experienced agents and brokers in obtaining listings and in closing a sufficient number of sales.

Nature of the Work

One of the most complex and important financial events in peoples' lives is the purchase or sale of a home or investment property. Because of this complexity and importance, people usually seek the help of real estate brokers and sales agents when buying or selling real estate.

Real estate brokers and sales agents have a thorough knowledge of the real estate market in their community. They know which neighborhoods will best fit clients' needs and budgets. They are familiar with local zoning and tax laws and know where to obtain financing. Agents and brokers also act as intermediaries in price negotiations between buyers and sellers.

Real estate agents usually are independent sales workers who provide their services to a licensed real estate broker on a contract basis. In return, the broker pays the agent a portion of the commission earned from the agent's sale of the property. Brokers are independent businesspeople who sell real estate owned by others; they also may rent or manage properties for a fee. When selling real estate, brokers arrange for title searches and for meetings between buyers and sellers wherein details of the transactions are agreed upon and the new owners take possession of the property. A broker may help to arrange favorable financing from a lender for the prospective buyer; often, this makes the difference between success and failure in closing a sale. In some cases, brokers and agents assume primary responsibility for closing sales; in others, lawyers or lenders do so. Brokers supervise agents who may have many of the same job duties. Brokers also manage their own offices, advertise properties, and handle other business matters. Some combine other types of work, such as selling insurance or practicing law, with their real estate business.

Besides making sales, agents and brokers must have properties to sell. Consequently, they spend a significant amount of time obtaining listings—agreements by owners to place properties for sale with the firm. When listing a property for sale, agents and brokers compare the listed property with similar properties that recently sold, in order to determine a competitive market price for the property. Once the property is sold, the agent who sold it and the agent who obtained the listing both receive a portion of the commission. Thus, agents who sell a property that they themselves have listed can increase their commission.

Most real estate brokers and sales agents sell residential property. A small number, usually employed in large or specialized firms, sell commercial, industrial, agricultural, or other types of real estate. Every specialty requires knowledge of that particular type of property and clientele. Selling or leasing business property requires an understanding of leasing practices, business trends, and the location of the property. Agents who sell or lease industrial properties must know about the region's transportation, utilities, and labor supply. Whatever the type of property, the agent or broker must know how to meet the client's particular requirements.

Before showing residential properties to potential buyers, agents meet with them to get a feeling for the type of home the buyers would like. In this pre-qualifying phase, the agent determines how much the buyers can afford to spend. In addition, the agent and the buyer usually sign a loyalty contract, which states the agent will be the only one to show houses to the buyers. An agent or broker uses a computer to generate lists of properties for sale, their location and description, and available sources of financing. In some cases, agents and brokers use computers to give buyers a virtual tour of properties in which they are interested. With a computer, buyers can view interior and exterior images or floor plans without leaving the real estate office.

Agents may meet several times with prospective buyers to discuss and visit available properties. Agents identify and emphasize the most pertinent selling points. To a young family looking for a house, they may emphasize the convenient floor plan, the area's low crime rate, and the proximity to schools and shopping centers. To a potential investor, they may point out the tax advantages of owning a rental property and the ease of finding a renter. If bargaining over price becomes necessary, agents must follow their client's instructions carefully and may have to present counteroffers in order to get the best possible price.

Once both parties have signed the contract, the real estate broker or agent must make sure that all special terms of the contract are met before the closing date. For example, the agent must make sure that the mandated and agreed-upon inspections, including that of the home and termite and radon inspections, take place. In addition, if the seller agrees to any repairs, the broker or agent must see that they are made. Increasingly, brokers and agents are handling environmental problems as well, by making sure that the properties they sell meet environmental regulations. For example, they may be responsible for dealing with lead paint on the walls. While loan officers, attorneys, or other persons handle many details, the agent must ensure that they are completed.

Working Conditions

Advances in telecommunications and the ability to retrieve data about properties over the Internet allow many real estate brokers and sales agents to work out of their homes instead of real estate offices. Even with this convenience, much of the time of these workers is spent away from their desks—showing properties to customers, analyzing properties for sale, meeting with prospective clients, or researching the state of the market.

Agents and brokers often work more than a standard 40-hour week. They usually work evenings and weekends and are always on call to suit the needs of clients. Business usually is slower during the winter season. Although the hours are long and

frequently irregular, most agents and brokers have the freedom to determine their own schedule. Consequently, they can arrange their work so that they can have time off when they want it.

Employment

In 2002, real estate brokers held about 99,000 jobs; real estate sales agents held 308,000. Many worked part time, combining their real estate activities with other careers. Almost 6 out of 10 real estate agents and brokers were self-employed. Real estate is sold in all areas, but employment is concentrated in large urban areas and in smaller, but rapidly growing communities.

Most real estate firms are relatively small; indeed, some are one-person businesses. By contrast, some large real estate firms have several hundred agents operating out of numerous branch offices. Many brokers have franchise agreements with national or regional real estate organizations. Under this type of arrangement, the broker pays a fee in exchange for the privilege of using the more widely known name of the parent organization. Although franchised brokers often receive help in training sales staff and running their offices, they bear the ultimate responsibility for the success or failure of their firms.

Real estate brokers and sales agents are older, on average, than most other workers. Historically, many homemakers and retired persons were attracted to real estate sales by the flexible and part-time work schedules characteristic of the field. These individuals could enter, leave, and later reenter the occupation, depending on the strength of the real estate market, their family responsibilities, or other personal circumstances. Recently, however, the attractiveness of part-time real estate work has declined, as increasingly complex legal and technological requirements are raising startup costs associated with becoming an agent.

Training, Other Qualifications, and Advancement

In every State and the District of Columbia, real estate brokers and sales agents must be licensed. Prospective agents must be high school graduates, at least 18 years old, and pass a written test. The examination—more comprehensive for brokers than for agents—includes questions on basic real estate transactions and laws affecting the sale of property. Most States require candidates for the general sales license to complete between 30 and 90 hours of classroom instruction. Those seeking a broker's license need between 60 and 90 hours of formal training and a specific amount of experience selling real estate, usually 1 to 3 years. Some States waive the experience requirements for the broker's license for applicants who have a bachelor's degree in real estate.

State licenses typically must be renewed every 1 or 2 years, usually without having to take an examination. However, many States require continuing education for license renewals. Prospective agents and brokers should contact the real estate licensing commission of the State in which they wish to work in order to verify exact licensing requirements.

As real estate transactions have become more legally complex, many firms have turned to college graduates to fill positions. A large number of agents and brokers have some college training. College courses in real estate, finance, business

administration, statistics, economics, law, and English are helpful. For those who intend to start their own company, business courses such as marketing and accounting are as important as those in real estate or finance.

Personality traits are equally as important as academic background. Brokers look for applicants who possess a pleasant personality, are honest, and present a neat appearance. Maturity, tact, trustworthiness, and enthusiasm for the job are required in order to motivate prospective customers in this highly competitive field. Agents should be well organized, be detail oriented, and have a good memory for names, faces, and business particulars.

Those interested in jobs as real estate agents often begin in their own communities. Their knowledge of local neighborhoods is a clear advantage. Under the direction of an experienced agent, beginners learn the practical aspects of the job, including the use of computers to locate or list available properties and identify sources of financing.

Many firms offer formal training programs for both beginners and experienced agents. Larger firms usually offer more extensive programs than smaller firms. More than a thousand universities, colleges, and junior colleges offer courses in real estate. At some, a student can earn an associate's or bachelor's degree with a major in real estate; several offer advanced degrees. Many local real estate associations that are members of the National Association of Realtors sponsor courses covering the fundamentals and legal aspects of the field. Advanced courses in mortgage financing, property development and management, and other subjects also are available through various affiliates of the National Association of Realtors.

Advancement opportunities for agents may take the form of higher rates of commission. As agents gain knowledge and expertise, they become more efficient in closing a greater number of transactions and increase their earnings. In many large firms, experienced agents can advance to sales manager or general manager. Persons who have received their broker's license may open their own offices. Others with experience and training in estimating property value may become real estate appraisers, and people familiar with operating and maintaining rental properties may become property managers. Experienced agents and brokers with a thorough knowledge of business conditions and property values in their localities may enter mortgage financing or real estate investment counseling.

Job Outlook

Employment of real estate brokers and sales agents is expected to grow more slowly than the average for all occupations through the year 2012. Increasing use of information technology will continue to raise the productivity of agents and brokers, limiting the potential for job growth to a certain extent. Prospective customers often can conduct their own searches for properties that meet their criteria by accessing real estate information on the Internet. Real estate companies often use computer-generated images to show houses to customers without leaving the office. In addition, cellular phones can send and receive large amounts of data, allowing agents and brokers to become more efficient and to serve a greater number of customers. However, most people still want and need the services of real estate agents and brokers to handle the actual sale. The use of technology may eliminate some marginal agents, such as those practicing real estate part-time or temporarily

between jobs. Such workers generally are not able to compete with full-time agents who have invested in the technology. Changing legal requirements, such as disclosure laws, may also dissuade some who are not serious about practicing full time from continuing to work part time.

Real estate agents and brokers will continue to experience some employment growth due to the increasing housing needs of a growing population, as well as the perception that real estate is a good investment. Low interest rates should continue to stimulate sales of real estate, resulting in the need for more agents and brokers. In addition, a large number of job openings will arise each year from the need to replace workers who transfer to other occupations or leave the labor force. This occupation is relatively easy to enter and is attractive, due to the flexible working conditions, the high interest in, and knowledge of, local real estate markets that entrants often have, and the potential for high earnings. Therefore, although gaining a job as a real estate agent or broker may be relatively easy, beginning agents and brokers may face competition from well-established, more experienced agents and brokers in obtaining listings and in closing a sufficient number of sales. Well-trained, ambitious people who enjoy selling, especially those with extensive social and business connections in their communities, should have the best chance for success.

Employment of real estate brokers and sales agents often is sensitive to swings in the economy, especially interest rates. During periods of declining economic activity and increasing interest rates, the volume of sales and the resulting demand for sales workers falls. As a result, the earnings of agents and brokers decline, and many work fewer hours or leave the occupation altogether.

Earnings

The median annual earnings of salaried real estate agents, including commissions, were \$30,930 in 2002. The middle 50 percent earned between \$21,010 and \$52,860 a year. The lowest 10 percent earned less than \$15,480, and the highest 10 percent earned more than \$83,780.

Median annual earnings of salaried real estate brokers, including commission, were \$50,330 in 2002. The middle 50 percent earned between \$29,240 and \$90,170 a year. The lowest 10 percent earned less than \$17,920, and the highest 10 percent earned more than \$145,600 a year.

Commissions on sales are the main source of earnings of real estate agents and brokers. The rate of commission varies according to whatever the agent and broker agree on, the type of property, and its value. The percentage paid on the sale of farm and commercial properties or unimproved land usually is higher than the percentage paid for selling a home.

Commissions may be divided among several agents and brokers. The broker or agent who obtained the listing usually shares their commission when the property is sold with the broker or agent who made the sale, and also with the firm that employs them. Although an agent's share varies greatly from one firm to another, often it is about half of the total amount received by the firm. Agents who both list and sell a property maximize their commission.

Income usually increases as an agent gains experience, but individual ability, economic conditions, and the type and location of the property also affect earnings. Sales workers who are active in community organizations and in local real estate associations can broaden their contacts and increase their earnings. A beginner's earnings often are irregular, because a few weeks or even months may go by without a sale. Although some brokers allow an agent to draw against future earnings from a special account, the practice is not usual with new employees. The beginner, therefore, should have enough money to live for about 6 months or until commissions increase.

Sources of Additional Information

Information on license requirements for real estate brokers and sales agents is available from most local real estate organizations or from the State real estate commission or board. More information about opportunities in real estate is available on the Internet site of the following organization:

- National Association of Realtors. Internet: <http://www.realtor.org>

Brick masons and Stonemasons

[Back to Menu](#)

Significant Points

- Job prospects are expected to be excellent.
- Most entrants learn informally on the job, but apprenticeship programs provide the most thorough training.
- The work is usually outdoors and involves lifting heavy materials and working on scaffolds.
- More than 1 out of 4 are self-employed.

Nature of the Work

Brick masons, block masons, and stonemasons work in closely related trades creating attractive, durable surfaces and structures. The work varies in complexity, from laying a simple masonry walkway to installing an ornate exterior on a high-rise building. **Brick masons and block masons**—who often are called simply *bricklayers*—build and repair walls, floors, partitions, fireplaces, chimneys, and other structures with brick, pre-cast masonry panels, concrete block, and other masonry materials. Some brick masons specialize in installing firebrick linings in industrial furnaces. **Stonemasons** build stone walls, as well as set stone exteriors and floors. They work with two types of stone—natural cut stone, such as marble, granite, and limestone; and artificial stone made from concrete, marble chips, or other masonry materials. Stonemasons usually work on nonresidential structures, such as houses of worship, hotels, and office buildings.

When building a structure, brick masons use 1 of 2 methods, the corner lead or the corner pole. Using the corner lead method, they begin by constructing a pyramid of bricks at each corner—called a lead. After the corner leads are complete, less experienced brick masons fill in the wall between the corners, using a line from

corner to corner to guide each course, or layer, of brick. Due to the precision needed, corner leads are time-consuming to erect and require the skills of experienced bricklayers.

Because of the expense associated with building corner leads, most brick masons use corner poles, also called masonry guides that enable them to build an entire wall at the same time. They fasten the corner poles (posts) in a plumb position to define the wall line and stretch a line between them. This line serves as a guide for each course of brick. Brick masons then spread a bed of mortar (a cement, sand, and water mixture) with a trowel (a flat, bladed metal tool with a handle), place the brick on the mortar bed, and press and tap the brick into place. Depending on blueprint specifications, brick masons either cut bricks with a hammer and chisel or saw them to fit around windows, doors, and other openings. Mortar joints are then finished with jointing tools for a sealed, neat, uniform appearance. Although brick masons typically use steel supports, or lintels, at window and door openings, they sometimes build brick arches, which support and enhance the beauty of the brickwork.

Stonemasons often work from a set of drawings, in which each stone has been numbered for identification. Helpers may locate and carry these prenumbered stones to the masons. A derrick operator using a hoist may be needed to lift large stone pieces into place.

When building a stonewall, masons set the first course of stones into a shallow bed of mortar. They then align the stones with wedges, plumb lines, and levels, and work them into position with a hard rubber mallet. Masons continue to build the wall by alternating layers of mortar and courses of stone. As the work progresses, masons remove the wedges, fill the joints between stones, and use a pointed metal tool, called a tuck pointer, to smooth the mortar to an attractive finish. To hold large stones in place, stonemasons attach brackets to the stone and weld or bolt these brackets to anchors in the wall. Finally, masons wash the stone with a cleansing solution to remove stains and dry mortar.

When setting stone floors, which often consist of large and heavy pieces of stone, masons first use a trowel to spread a layer of damp mortar over the surface to be covered. Using crowbars and hard rubber mallets for aligning and leveling, they then set the stone in the mortar bed. To finish, workers fill the joints and wash the stone slabs.

Masons use a special hammer and chisel to cut stone. They cut stone along the grain to make various shapes and sizes, and valuable pieces often are cut with a saw that has a diamond blade. Some masons specialize in setting marble, which, in many respects, is similar to setting large pieces of stone. Brick masons and stonemasons also repair imperfections and cracks, and replace broken or missing masonry units in walls and floors.

Most nonresidential buildings now are built with walls made of concrete block, brick veneer, stone, granite, marble, tile, or glass. In the past, masons doing nonresidential interior work mainly built block partition walls and elevator shafts, but because many types of masonry and stone are used in the interiors of today's nonresidential structures, these workers now must be more versatile. For example, some brick masons and block masons now install structural insulated wall panels and masonry accessories used in many high-rise buildings.

Refractory masons are brick masons who specialize in installing firebrick and refractory tile in high-temperature boilers, furnaces, cupolas, ladles, and soaking pits in industrial establishments. Most of these workers are employed in steel mills, where molten materials flow on refractory beds from furnaces to rolling machines.

Working Conditions

Brick masons, block masons, and stonemasons usually work outdoors and are exposed to the elements. They stand, kneel, and bend for long periods and often have to lift heavy materials. Common hazards include injuries from tools and falls from scaffolds, but these can often be avoided when proper safety equipment is used and safety practices are followed.

Employment

Brick masons, block masons, and stonemasons held 165,000 jobs in 2002. The vast majority were brick masons. Workers in these crafts are employed primarily by building, specialty trade, or general contractors. Brick masons, block masons, and stonemasons work throughout the country but like the general population, are concentrated in metropolitan areas.

More than one out of four brick masons, block masons, and stonemasons are self-employed. Many of the self-employed specialize in contracting to work on small jobs, such as patios, walkways, and fireplaces.

Training, Other Qualifications, and Advancement

Most brick masons, block masons, and stonemasons pick up their skills informally, observing and learning from experienced workers. Many others receive training in vocational education schools or from industry-based programs that are common throughout the country. Another way to learn these skills is through an apprenticeship program, which generally provides the most thorough training.

Individuals who learn the trade on the job usually start as helpers, laborers, or mason tenders. These workers carry materials, move scaffolds, and mix mortar. When the opportunity arises, they learn from experienced craftworkers how to spread mortar, lay brick and block, or set stone. As they gain experience, they make the transition to full-fledged craftworkers. The learning period on the job may last longer than an apprenticeship program. Industry-based training programs offered through companies usually last between 2 and 4 years.

Apprenticeships for brick masons, block masons, and stonemasons usually are sponsored by local contractors, trade associations, or by local union-management committees. The apprenticeship program requires 3 years of on-the-job training, in addition to a minimum 144 hours of classroom instruction each year in subjects such as blueprint reading, mathematics, layout work, and sketching.

Apprentices often start by working with laborers, carrying materials, mixing mortar, and building scaffolds. This period generally lasts about a month and familiarizes the apprentice with job routines and materials. Next, apprentices learn to lay, align, and

join brick and block. They also learn to work with stone and concrete, which enables them to be certified to work with more than one masonry material.

Applicants for apprenticeships must be at least 17 years old and in good physical condition. A high school education is preferable; and courses in mathematics, mechanical drawing, and shop are helpful. The Associated Builders and Contractors and International Masonry Institute (IMI), a joint trust of the International Union of Bricklayers and Allied Craftworkers and the contractors who employ its members, operates training centers in several large cities that help jobseekers develop the skills needed to successfully complete the formal apprenticeship program. In order to attract more entrants, IMI has expanded these centers in recent years to recruit and train workers before they enter apprenticeship programs. In addition, the IMI has a national training and education center at Fort Ritchie, MD. The national center's programs teach basic job skills for brick, stone, tile, terrazzo, refractory, and restoration work, as well as safety and scaffolding training.

Bricklayers who work in nonresidential construction usually work for large contractors and receive well-rounded training—normally through apprenticeship in all phases of brick or stonework. Those who work in residential construction usually work primarily for small contractors and specialize in only one or two aspects of the job.

With additional training, brick masons, block masons, and stonemasons may become supervisors for masonry contractors. Some eventually become owners of businesses employing many workers and may spend most of their time as managers rather than as brick masons, block masons, or stonemasons. Others move into closely related areas such as construction management or building inspection.

Job Outlook

Job opportunities for brick masons, block masons, and stonemasons are expected to be excellent through 2012. Many openings will result from the need to replace workers who retire, transfer to other occupations, or leave these trades for other reasons. There may be fewer applicants than needed because many potential workers prefer to work under less strenuous, more comfortable conditions.

Employment of brick masons, block masons, and stonemasons is expected to increase about as fast as the average for all occupations over the 2002-12 period, as population and business growth create a need for new houses, industrial facilities, schools, hospitals, offices, and other structures. Also stimulating demand will be the need to restore a growing stock of old masonry buildings, as well as the increasing use of brick and stone for decorative work on building fronts and in lobbies and foyers. Brick exteriors should remain very popular, reflecting a growing preference for durable exterior materials requiring little maintenance.

Employment of brick masons, block masons, and stonemasons, like that of many other construction workers, is sensitive to changes in the economy. When the level of construction activity falls, workers in these trades can experience periods of unemployment.

Earnings

Median hourly earnings of brick masons and block masons in 2002 were \$20.11. The middle 50 percent earned between \$15.36 and \$25.32. The lowest 10 percent earned less than \$11.55, and the highest 10 percent earned more than \$30.66. Median hourly earnings in the industries employing the largest number of brick masons in 2002 are shown below:

Nonresidential building construction	\$22.12
Foundation, structure, and building exterior contractors	20.26

Median hourly earnings of stonemasons in 2002 were \$16.36. The middle 50 percent earned between \$12.06 and \$20.76. The lowest 10 percent earned less than \$9.43, and the highest 10 percent earned more than \$26.59.

Earnings for workers in these trades can be reduced on occasion because poor weather and downturns in construction activity limit the time they can work. Apprentices or helpers usually start at about 50 percent of the wage rate paid to experienced workers. Pay increases as apprentices gain experience and learn new skills.

Some brick masons, block masons, and stonemasons are members of the International Union of Bricklayers and Allied Craftworkers.

Sources of Additional Information

For details about apprenticeships or other work opportunities in these trades, contact local bricklaying, stonemasonry, or marble-setting contractors; the Associated Builders and Contractors; a local of the International Union of Bricklayers and Allied Crafts workers; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or apprenticeship agency. For general information about the work of brick masons, block masons, or stonemasons, contact:

- International Union of Bricklayers and Allied Craftworkers, 1776 I St. NW., Washington, DC. 20006.
- Associated Builders and Contractors, Workforce Development Department, 4250 North Fairfax Dr., 9th Floor, Arlington, VA 22203.
- International Masonry Institute, Apprenticeship and Training, The James Brice House, 42 East St., Annapolis, MD 21401. Internet: <http://www.imiweb.org>
- Associated General Contractors of America, Inc., 333 John Carlyle St., Alexandria, VA 22314. Internet: <http://www.agc.org>
- Brick Industry Association, 11490 Commerce Park Dr., Reston, VA 22091-1525. Internet: <http://www.brickinfo.org>
- National Association of Home Builders, 1201 15th St. NW., Washington, DC 20005. Internet: <http://www.nahb.org> Home Builders Institute, 1201 15th St. NW., Washington, DC 20005. Internet <http://www.hbi.org>
- National Concrete Masonry Association, 13750 Sunrise Valley Dr., Herndon, VA 20171-3499. Internet: <http://www.ncma.org>

- There are more than 500 occupations registered by the U.S. Department of Labor's National Apprenticeship system. For more information on the Labor Department's registered apprenticeship system and links to State apprenticeship programs, check their website: <http://www.doleta.gov>

Drywall Installers

[Back to Menu](#)

Significant Points

- Most workers learn the trade on the job, by working either as helpers or through a formal apprenticeship.
- Job prospects are expected to be good.
- Inclement weather seldom interrupts work, but workers may be idled when downturns in the economy slow new construction activity.

Nature of the Work

Drywall consists of a thin layer of gypsum between two layers of heavy paper. It is used for walls and ceilings in most buildings today because it is both faster and cheaper to install than plaster.

There are two kinds of drywall workers—installers and tapers—although many workers do both types of work. Installers, also called **applicators or hangers**, fasten drywall panels to the inside framework of residential houses and other buildings. **Tapers**, or **finishers**, prepare these panels for painting by taping and finishing joints and imperfections.

Because drywall panels are manufactured in standard sizes—usually 4 feet by 8 or 12 feet—drywall installers must measure, cut, and fit some pieces around doors and windows. They also saw or cut holes in panels for electrical outlets, air-conditioning units, and plumbing. After making these alterations, installers may glue, nail, or screw the wallboard panels to the wood or metal framework. Because drywall is heavy and cumbersome, a helper generally assists the installer in positioning and securing the panel. Workers often use a lift when placing ceiling panels.

After the drywall is installed, tapers fill joints between panels with a joint compound. Using the wide, flat tip of a special trowel, they spread the compound into and along each side of the joint with brush-like strokes. They immediately use the trowel to press a paper tape—used to reinforce the drywall and to hide imperfections—into the wet compound and to smooth away excess material. Nail and screw depressions also are covered with this compound, as are imperfections caused by the installation of air-conditioning vents and other fixtures. On large projects, finishers may use automatic taping tools that apply the joint compound and tape in one step. Tapers apply second and third coats of the compound, sanding the treated areas where needed after each coat to make them as smooth as the rest of the wall surface. This results in a very smooth and almost perfect surface. Some tapers apply textured surfaces to walls and ceilings with trowels, brushes, or spray guns.

Ceiling tile installers or acoustical carpenters, apply or mount acoustical tiles or blocks, strips, or sheets of shock-absorbing materials to ceilings and walls of buildings to reduce reflection of sound or to decorate rooms. First, they measure and mark the surface according to blueprints and drawings. Then, they nail or screw moldings to the wall to support and seal the joint between the ceiling tile and the wall. Finally, they mount the tile, either by applying a cement adhesive to the back of the tile and then pressing the tile into place, or by nailing, screwing, stapling, or wire-tying the lath directly to the structural framework.

Lathers also are included in this occupation. Lathers fasten metal or rock board lath to walls, ceilings, and partitions of buildings. Lath forms the support base for plaster, fireproofing, or acoustical materials. At one time, lath was made of wooden strips. Now, lathers work mostly with wire, metal mesh, or rock board lath. Metal lath is used where the plaster application will be exposed to weather or water or for curved or irregular surfaces for which drywall is not a practical material. Using hand tools and portable power tools, lathers nail, screw, staple, or wire-tie the lath directly to the structural framework.

Working Conditions

As in many other construction trades, the work sometimes is strenuous. Drywall installers, ceiling tile installers, and tapers spend most of the day on their feet, either standing, bending, or kneeling. Some tapers use stilts to tape and finish ceiling and angle joints. Installers have to lift and maneuver heavy panels. Hazards include falls from ladders and scaffolds and injuries from power tools and from working with sharp materials. Because sanding a joint compound to a smooth finish creates a great deal of dust, some finishers wear masks for protection.

Employment

Drywall installers, ceiling tile installers, and tapers held about 176,000 jobs in 2002. Most worked for contractors specializing in drywall and ceiling tile installation; others worked for contractors doing many kinds of construction. About 33,000 were self-employed independent contractors.

Most installers and tapers are employed in populous areas. In other areas, where there may not be enough work to keep a drywall or ceiling tile installer employed full time, carpenters and painters usually do the work.

Training, Other Qualifications, and Advancement

Most drywall installers, ceiling tile installers, and tapers start as helpers and learn their skills on the job. Installer helpers start by carrying materials, lifting and holding panels, and cleaning up debris. Within a few weeks, they learn to measure, cut, and install materials. Eventually, they become fully experienced workers. Taper apprentices begin by taping joints and touching up nail holes, scrapes, and other imperfections. They soon learn to install corner guards and to conceal openings around pipes. At the end of their training, drywall installers, ceiling tile installers, and tapers learn to estimate the cost of installing and finishing drywall.

Some drywall installers, ceiling tile installers, and tapers learn their trade in an apprenticeship program. The United Brotherhood of Carpenters and Joiners of America, in cooperation with local contractors, administers an apprenticeship program both in drywall installation and finishing and in acoustical carpentry. Apprenticeship programs consist of at least 3 years, or 6,000 hours, of on-the-job training and 144 hours a year of related classroom instruction. In addition, local affiliates of the Associated Builders and Contractors and the National Association of Home Builders conduct training programs for nonunion workers. The International Union of Painters and Allied Trades conducts an apprenticeship program in drywall finishing that lasts 2 to 3 years.

Employers prefer high school graduates who are in good physical condition, but they frequently hire applicants with less education. High school or vocational school courses in carpentry provide a helpful background for drywall work. Regardless of educational background, installers must be good at simple arithmetic. Other useful high school courses include English, wood shop, metal shop, blueprint reading, and mechanical drawing.

Drywall installers, ceiling tile installers, and tapers with a few years of experience and with leadership ability may become supervisors. Some workers start their own contracting businesses.

Job Outlook

Job opportunities for drywall installers, ceiling tile installers, and tapers are expected to be good. Many potential workers are not attracted to this occupation because they prefer work that is less strenuous and has more comfortable working conditions. Experienced workers will have especially favorable opportunities.

Employment is expected to grow faster than the average for all occupations over the 2002-12 period, reflecting increases in the numbers of new construction and remodeling projects. In addition to jobs involving traditional interior work, drywall workers will find employment opportunities in the installation of insulated exterior wall systems, which are becoming increasingly popular.

Besides those resulting from job growth, many jobs will open up each year because of the need to replace workers who transfer to other occupations or leave the labor force. Some drywall installers, ceiling tile installers, and tapers with limited skills leave the occupation when they find that they dislike the work or fail to find steady employment.

Despite the growing use of exterior panels, most drywall installation and finishing is done indoors. Therefore, drywall workers lose less work time because of inclement weather than do some other construction workers. Nevertheless, they may be unemployed between construction projects and during downturns in construction activity.

Earnings

In 2002, the median hourly earnings of drywall and ceiling tile installers were \$16.21. The middle 50 percent earned between \$12.43 and \$21.50. The lowest 10

percent earned less than \$9.76, and the highest 10 percent earned more than \$28.03. The median hourly earnings in the industries employing the largest numbers of drywall and ceiling tile installers in 2002 were:

Building finishing contractors	\$16.50
Nonresidential building construction	14.66

In 2002, the median hourly earnings of tapers were \$18.75. The middle 50 percent earned between \$14.57 and \$24.68. The lowest 10 percent earned less than \$11.07, and the highest 10 percent earned more than \$29.32.

Trainees usually started at about half the rate paid to experienced workers and received wage increases as they became more highly skilled.

Some contractors pay these workers according to the number of panels they install or finish per day; others pay an hourly rate. A 40-hour week is standard, but the workweek may sometimes be longer. Workers who are paid hourly rates receive premium pay for overtime.

Sources of Additional Information

For information about work opportunities in drywall application and finishing and ceiling tile installation, contact local drywall installation and ceiling tile installation contractors, a local of the unions previously mentioned, a local joint union-management apprenticeship committee, a State or local chapter of the Associated Builders and Contractors, or the nearest office of the State employment service or apprenticeship agency.

For details about job qualifications and training programs in drywall application and finishing and ceiling tile installation, contact:

- Associated Builders and Contractors, 1300 N. 17th St., Arlington, VA 22209.
- National Association of Home Builders, 1201 15th St. NW. Suite 800, Washington, DC 20005. Internet: <http://www.nahb.org>
- Home Builders Institute, 1201 15th St. NW., Washington, DC 20005. Internet: <http://www.hbi.org>
- International Union of Painters and Allied Trades, 1750 New York Ave. NW., Washington, DC 20006. Internet: <http://www.iupat.org>
- United Brotherhood of Carpenters and Joiners of America, 50 F St. NW., Washington, DC 20001. Internet: <http://www.carpenters.org>

There are more than 500 occupations registered by the U.S. Department of Labor's National Apprenticeship system. For more information on the Labor Department's registered apprenticeship system and links to State apprenticeship programs, check their Web site: <http://www.doleta.gov>.

Significant Points

- Increasing office automation and organizational restructuring will lead to slow growth in overall employment of secretaries and administrative assistants.
- Numerous job openings will result from the need to replace workers who leave this very large occupation each year.
- Opportunities should be best for applicants with extensive knowledge of software applications.

Nature of the Work

As the reliance on technology continues to expand in offices across the Nation, the role of the office professional has greatly evolved. Office automation and organizational restructuring have led secretaries and administrative assistants to assume a wider range of new responsibilities once reserved for managerial and professional staff. Many secretaries and administrative assistants now provide training and orientation for new staff, conduct research on the Internet, and operate and troubleshoot new office technologies. In the midst of these changes, however, their core responsibilities have remained much the same—performing and coordinating an office’s administrative activities, and storing, retrieving, and integrating information for dissemination to staff and clients.

Secretaries and administrative assistants are responsible for a variety of administrative and clerical duties necessary to run an organization efficiently. They serve as an information manager for an office, plan and schedule meetings and appointments, organize and maintain paper and electronic files, manage projects, conduct research, and provide information by using the telephone, postal mail, and e-mail. They also may handle travel arrangements.

Secretaries are aided in these tasks by a variety of office equipment, such as facsimile machines, photocopiers, and telephone systems. In addition, secretaries and administrative assistants use personal computers to create spreadsheets, compose correspondence, manage databases, and create presentations, reports, and documents by using desktop publishing software and digital graphics—all tasks previously handled by managers and professionals. At the same time, these other office workers have assumed many tasks traditionally assigned to secretaries and administrative assistants, such as word processing and answering the telephone.

Specific job duties vary with experience and titles. **Executive secretaries and administrative assistants**, for example, perform fewer clerical tasks than do other secretaries. In addition to arranging conference calls and scheduling meetings, they may handle more complex responsibilities such as conducting research, preparing statistical reports, training employees, and supervising other clerical staff.

Some secretaries and administrative assistants, such as legal and medical secretaries, perform highly specialized work requiring knowledge of technical terminology and procedures. For instance, **legal secretaries** prepare correspondence and legal papers such as summonses, complaints, motions,

responses, and subpoenas under the supervision of an attorney or paralegal. They also may review legal journals and assist in other ways with legal research, as by verifying quotes and citations in legal briefs. **Medical secretaries** transcribe dictation, prepare correspondence, and assist physicians or medical scientists with reports, speeches, articles, and conference proceedings. They also record simple medical histories, arrange for patients to be hospitalized, and order supplies. Most medical secretaries need to be familiar with insurance rules, billing practices, and hospital or laboratory procedures. Other technical secretaries who assist engineers or scientists may prepare correspondence, maintain the technical library, and gather and edit materials for scientific papers.

Working Conditions

Secretaries and administrative assistants usually work in schools, hospitals, corporate settings, or legal and medical offices. Their jobs often involve sitting for long periods. If they spend a lot of time typing, particularly at a video display terminal, they may encounter problems of eyestrain, stress, and repetitive motion, such as carpal tunnel syndrome.

Office work can lend itself to alternative or flexible working arrangements, such as part-time work or telecommuting—especially if the job requires extensive computer use. About one secretary in six works part time and many others work in temporary positions. A few participate in job-sharing arrangements in which two people divide responsibility for a single job. The majority of secretaries, however, are full-time employees who work a standard 40-hour week.

Employment

Secretaries and administrative assistants held about 4.1 million jobs in 2002, ranking among the largest occupations in the U.S. economy. The following tabulation shows the distribution of employment by secretarial specialty.

Secretaries, except legal, medical, and executive	1,975,000
Executive secretaries and administrative assistants	1,526,000
Medical secretaries	339,000
Legal secretaries	264,000

Secretaries and administrative assistants are employed in organizations of every type. Around 9 out of 10 secretaries and administrative assistants are employed in service-providing industries, ranging from education and health to government and retail trade. Most of the rest work for firms engaged in manufacturing or construction.

Training, Other Qualifications, and Advancement

High school graduates who have basic office skills may qualify for entry-level secretarial positions. However, employers increasingly require extensive knowledge of software applications, such as word processing, spreadsheets, and database management. Secretaries and administrative assistants should be proficient in keyboarding and good at spelling, punctuation, grammar, and oral communication.

Because secretaries and administrative assistants must be tactful in their dealings with people, employers also look for good customer service and interpersonal skills. Discretion, good judgment, organizational or management ability, initiative, and the ability to work independently are especially important for higher-level administrative positions.

As office automation continues to evolve, retraining and continuing education will remain an integral part of secretarial jobs. Changes in the office environment have increased the demand for secretaries and administrative assistants who are adaptable and versatile. Secretaries and administrative assistants may have to attend classes or participate in online education in order to learn how to operate new office technologies, such as information storage systems, scanners, the Internet, or new updated software packages. They may also get involved in selecting and maintaining equipment.

Secretaries and administrative assistants acquire skills in various ways. Training ranges from high school vocational education programs that teach office skills and keyboarding to 1- and 2-year programs in office administration offered by business schools, vocational-technical institutes, and community colleges. Many temporary placement agencies also provide formal training in computer and office skills. However, many skills tend to be acquired through on-the-job instruction by other employees or by equipment and software vendors. Specialized training programs are available for students planning to become medical or legal secretaries or administrative technology specialists. Bachelor's degrees and professional certifications are becoming increasingly important as business continues to become more global.

Testing and certification for proficiency in entry-level office skills is available through organizations such as the International Association of Administrative Professionals; NALS, Inc.; and Legal Secretaries International, Inc. As secretaries and administrative assistants gain experience, they can earn several different designations. Prominent designations include the Certified Professional Secretary (CPS) or the Certified Administrative Professional (CAP) designations, which can be earned by meeting certain experience and/or educational requirements and passing an examination. Similarly, those with one year of experience in the legal field, or who have concluded an approved training course and who want to be certified as a legal support professional, can acquire the Accredited Legal Secretary (ALS) designation through a testing process administered by NALS. NALS also offers two additional designations; an examination to confer the Professional Legal Secretary (PLS) designation, considered an advanced certification for legal support professionals, as well as a paralegal examination and designation for proficiency as a paralegal. Legal Secretaries International confers the Certified Legal Secretary Specialist (CLSS) designation in areas such as intellectual property, criminal law, civil litigation, probate, and business law, to those who have 5 years of law-related experience and pass an examination. In some instances, certain requirements may be waived.

Secretaries generally advance by being promoted to other administrative positions with more responsibilities. Qualified secretaries who broaden their knowledge of a company's operations and enhance their skills may be promoted to other positions such as senior or executive secretary, clerical supervisor, or office manager. Secretaries with word processing or data entry experience can advance to jobs as

word processing or data entry trainers, supervisors, or managers within their own firms or in a secretarial, word processing, or data entry service bureau. Secretarial experience can also lead to jobs such as instructor or sales representative with manufacturers of software or computer equipment. With additional training, many legal secretaries become paralegals.

Job Outlook

Overall employment of secretaries and administrative assistants is expected to grow more slowly than the average for all occupations over the 2002-12 period. In addition to those resulting from growth, numerous job openings will result from the need to replace workers who transfer to other occupations or leave this very large occupation for other reasons each year. Opportunities should be best for applicants, particularly experienced secretaries, with extensive knowledge of software applications.

Projected employment of secretaries will vary by occupational specialty. Employment growth in the health care and social assistance and legal services industries should lead to average growth for medical and legal secretaries. Employment of executive secretaries and administrative assistants is projected to grow more slowly than the average for all occupations. Rapidly growing industries—such as administrative and support services, health care and social assistance, educational services (private), and professional, scientific, and technical services—will continue to generate most new job opportunities. A decline in employment is expected for all other secretaries, except legal, medical, or executive. They account for almost half of all secretaries and administrative assistants.

Increasing office automation and organizational restructuring will continue to make secretaries and administrative assistants more productive in coming years. Personal computers, e-mail, scanners, and voice message systems will allow secretaries to accomplish more in the same amount of time. The use of automated equipment is also changing the distribution of work in many offices. In some cases, such traditional secretarial duties as keyboarding, filing, photocopying, and bookkeeping are being assigned to workers in other units or departments. Professionals and managers increasingly do their own word processing and data entry, and handle much of their own correspondence rather than submit the work to secretaries and other support staff. Also, in some law and medical offices, paralegals and medical assistants are assuming some tasks formerly done by secretaries. As other workers assume more of these duties, there is a trend in many offices for professionals and managers to “share” secretaries and administrative assistants. The traditional arrangement of one secretary per manager is becoming less prevalent; instead, secretaries and administrative assistants increasingly support systems, departments, or units. This approach often means that secretaries and administrative assistants assume added responsibilities and are seen as valuable members of a team, but it also contributes to the projected decline in the overall number of secretaries and administrative assistants.

Developments in office technology are certain to continue, and they will bring about further changes in the work of secretaries and administrative assistants. However, many secretarial and administrative duties are of a personal, interactive nature and, therefore, not easily automated. Responsibilities such as planning conferences, working with clients, and instructing staff require tact and communication skills.

Because technology cannot substitute for these personal skills, secretaries and administrative assistants will continue to play a key role in most organizations.

Earnings

Median annual earnings of executive secretaries and administrative assistants were \$33,410 in 2002. The middle 50 percent earned between \$26,980 and \$41,350. The lowest 10 percent earned less than \$22,270, and the highest 10 percent earned more than \$50,420. Median annual earnings in the industries employing the largest numbers of executive secretaries and administrative assistants in 2002 were:

Management of companies and enterprises	\$36,770
Local government	34,600
Colleges, universities, and professional schools	32,210
State government	31,220
Employment services	29,700

Median annual earnings of legal secretaries were \$35,020 in 2002. The middle 50 percent earned between \$27,540 and \$44,720. The lowest 10 percent earned less than \$21,990, and the highest 10 percent earned more than \$54,810. Medical secretaries earned a median annual salary of \$25,430 in 2002. The middle 50 percent earned between \$21,090 and \$31,070. The lowest 10 percent earned less than \$18,310, and the highest 10 percent earned more than \$37,550. Median annual earnings of secretaries, except legal, medical, and executive, were about \$25,290 in 2002.

Salaries vary a great deal, however, reflecting differences in skill, experience, and level of responsibility. Salaries also vary in different parts of the country; earnings are usually lowest in southern cities, and highest in northern and western cities. Certification in this field usually is rewarded by a higher salary.

Sources of Information

For information on the Certified Professional Secretary or Certified Administrative Professional designations, contact International Association of Administrative Professionals, 10502 NW Ambassador Dr., P.O. Box 20404, Kansas City, MO 64195-0404. Internet: www.iaap-hq.org

Information on the Certified Legal Secretary Specialist (CLSS) designation can be obtained from Legal Secretaries International Inc., Internet: legalsecretaries.org

Information on the Accredited Legal Secretary (ALS), Professional Legal Secretary (PLS), and Paralegal certifications is available from NALS, Inc., 314 East 3rd St., Suite 210, Tulsa, OK 74120. Internet: <http://www.nals.org>

[End -- Go back to Table of Contents](#)