Job Outlook

Overall employment of industrial machinery installation, repair, and maintenance workers is projected to grow more slowly than the average for all occupations through 2010. Nevertheless, applicants with broad skills in machine repair should have favorable job prospects. As more firms introduce automated production equipment, industrial machinery installation, repair, and maintenance workers will be needed to ensure that these machines are properly maintained and consistently in operation. However, many new machines are capable of self-diagnosis, increasing their reliability and, thus, reducing the need for repairers. As a result, the majority of job openings will stem from the need to replace repairers who transfer to other occupations or leave the labor force.

As automation of machinery becomes more widespread, there is a greater need for repair work than for the installation of new machinery. Industrial machinery installation, repair, and maintenance workers are becoming more productive through the use of technologies such as hydraulic torque wrenches, ultrasonic measuring tools, and laser shaft alignment, as these technologies allow fewer workers to perform more work. In addition, the demand for industrial machinery installation, repair, and maintenance workers will be adversely affected as lower-paid workers, such as electronics technicians, increasingly assume some installation and maintenance duties.

Unlike many other occupations concentrated in manufacturing industries, industrial machinery installation, repair, and maintenance workers usually are not affected by seasonal changes in production. During slack periods, when some plant workers are laid off, repairers often are retained to do major overhaul jobs. Although these workers may face layoff or a reduced workweek when economic conditions are particularly severe, they usually are less affected than are other workers because machines have to be maintained regardless of production level.

Earnings

Earnings of industrial machinery installation, repair, and maintenance workers vary by industry and geographic region. Median hourly earnings of industrial machinery mechanics were $17.30 in 2000. The middle 50 percent earned between $13.73 and $21.93. The lowest 10 percent earned less than $11.31, and the highest 10 percent earned more than $26.26. Median hourly earnings in the industries employing the largest numbers of industrial machinery mechanics in 2000 are shown below:

Motor vehicles and equipment	$24.28
Electric services	24.12
Plastics materials and synthetics	20.14
Machinery, equipment, and supplies	15.01
Meat products	13.06

Median hourly earnings of general maintenance and repair workers were $13.39 in 2000. The middle 50 percent earned between $10.05 and $17.47. The lowest 10 percent earned less than $7.84, and the highest 10 percent earned more than $21.43. Median hourly earnings in the industries employing the largest numbers of general maintenance and repair workers in 2000 are shown below:

Local government	$13.99
Elementary and secondary schools	13.17
Real estate agents and managers	10.85
Real estate operators and lessors	10.71
Hotels and motels	10.07

Median hourly earnings of millwrights were $19.33 in 2000. The middle 50 percent earned between $15.19 and $23.98. The lowest 10 percent earned less than $12.02, and the highest 10 percent earned more than $27.07. Median hourly earnings in the industries employing the largest numbers of millwrights in 2000 are shown below:

Motor vehicles and equipment	$25.73
Miscellaneous special trade contractors	19.64
Blast furnace and basic steel products	18.85

Median hourly earnings of machinery maintenance workers were $14.89 in 2000. The middle 50 percent earned between $11.54 and $18.79. The lowest 10 percent earned less than $9.20, and the highest 10 percent earned more than $22.74. Median hourly earnings in miscellaneous plastics products, the industry employing the largest numbers of machinery maintenance workers, were $15.28 in 2000.

More than 25 percent of industrial machinery mechanics are union members. More than 67 percent of millwrights belong to labor unions, one of the highest rates of unionization in the economy. Labor unions that represent industrial machinery installation, repair, and maintenance workers include the United Steelworkers of America; the United Automobile, Aerospace and Agricultural Implement Workers of America; the International Association of Machinists and Aerospace Workers; and the International Union of Electronic, Electrical, Salaried, Machine, and Furniture Workers.

Related Occupations

Other occupations that involve repairing machinery include aircraft and avionics equipment mechanics and service technicians; electrical and electronics installers and repairers; coin, vending, and amusement machine servicers and repairers; automotive body and related repairers; automotive service technicians and mechanics; electronic home entertainment equipment installers and repairers; heating, air-conditioning, and refrigeration mechanics and installers; and radio and telecommunications equipment installers and repairers.

Sources of Additional Information

Information about employment and apprenticeship opportunities for industrial machinery installation, repair, and maintenance workers may be obtained from local offices of the State employment service or from:

- United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave. NW., Washington, DC 20001.
- The National Tooling and Machining Association, 9300 Livingston Rd., Fort Washington, MD 20744. Internet: **http://www.ntma.org**
- Precision Machined Products Association, 6700 West Snowville Rd., Brecksville, OH 44141. Internet: **http://www.pmpa.org**
- Associated General Contractors of America, 1957 E St. NW., Washington, DC 20006. Internet: **http://www.agc.org**

Line Installers and Repairers

(O*NET 49-9051.00, 49-9052.00)

Significant Points

- Projected employment growth reflects the expansion of telecommunications and cable networks.
- Line installers and repairers work outdoors; the work can be hazardous.
- Earnings are relatively high.

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; augers dig holes in the ground, and cranes set utility poles in place. Trenchers, cable plows, and borers cut openings in the earth for laying underground cables.

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, less often, climb the pole or tower. Next, they pull up cable by hand 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 powerlines, installers bolt or clamp insulators onto the poles before attaching the cable. Underground cable is laid directly in the trench, pulled through a tunnel, or strung through a conduit running through the 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 place wiring in houses and check that transmission signals are strong. Line installers may also 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 powerlines 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, telephone, 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 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).

Line installers use truck-mounted buckets to reach the tops of telephone poles.

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 powerline workers have the most hazardous jobs. High voltage powerlines can cause electrocution, and line installers and repairers must consequently use electrically insulated protective devices and tools when working with live cables. Powerlines 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 263,000 jobs in 2000. Approximately 164,000 were telecommunications line installers and repairers; the remainder were electrical power-line installers and repairers. Nearly all line installers and repairers worked for telephone, cable television, electric power, or construction companies.

Training, Other Qualifications, and Advancement

Line installers and repairers are trained on the job, and most employers generally require at least a high school diploma. However, employers prefer a technical knowledge of electricity and electronics obtained through vocational programs, community colleges, or experience in 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 60 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.

Line installers and repairers working for electric power companies generally complete formal apprenticeship 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.

Line installers and repairers in telephone and cable television companies receive several years of on-the-job training. They may also 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 faster than the average for all occupations through 2010. Much of this increase will result from growth in the telecommunications industry. 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 extremely popular services, such as high-speed Internet access. At the same time, deregulation of the telecommunications industry has reduced barriers to competition. As a result, numerous companies are installing high-capacity networks in order to compete for the increasing demand for telecommunications services. 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 50 years old, and are incapable of providing advanced services. Strong job growth is expected due to the expansion, maintenance, and modernization of telecommunications networks. Besides 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 faster than average. Telephone and cable television companies will create new networks and improve existing ones to 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. Businesses will install extensive private networks as they increasingly use telecommunications lines for access to suppliers and customers. The average residential customer already has more than two telephone lines. Increased demand for high-speed Internet access, fax lines, and multiple phone lines will require the improvement and expansion of local phone line networks.

Employment of electrical powerline installers and repairers, on the other hand, should grow more slowly than the average for all occupations through 2010. The demand for electricity has been consistently rising, driving the expansion of powerline networks, which tends to increase employment. However, industry deregulation is pushing companies to cut costs and maintenance, which tends to reduce employment. Also, many power companies are using their existing networks of towers and rights-of-way to expand into the telecommunications industry. Because electrical power companies have reduced hiring and training in recent years, opportunities should be best for workers who possess experience and training.

Earnings

Earnings for line installers and repairers are higher than in most other occupations that do not require postsecondary education. Median hourly earnings for electrical powerline installers and repairers were $22.01 in 2000. The middle 50 percent earned between $16.99 and $26.09. The lowest 10 percent earned less than $12.36, and the highest 10 percent earned more than $30.35. Median hourly earnings in the industries employing the largest numbers of electrical powerline installers and repairers in 2000 are shown below.

Combination utility services	$25.86
Telephone communication	22.80
Electric services	22.70
Heavy construction, except highway	16.86
Electrical work	16.84

Median hourly earnings for telecommunications line installers and repairers were $18.32 in 2000. The middle 50 percent earned between $12.82 and $23.82. The lowest 10 percent earned less than $9.79, and the highest 10 percent earned more than $26.68. Median hourly earnings in the industries employing the largest numbers of telephone and cable television line installers and repairers in 2000 are shown below.

Telephone communication	$22.88
Electrical work	14.88
Cable and other pay TV services	14.86
Heavy construction, except highway	12.26

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.

Related Occupations

Other workers who install and repair electronic equipment include broadcast and sound engineering technicians and radio operators, electricians, and radio and telecommunications equipment installers and repairers.

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 on line installer and repairer jobs, write to:

➤ Communications Workers of America, 501 3rd St. NW., Washington, DC 20001. Internet: **http://www.cwa-union.org**

➤ International Brotherhood of Electrical Workers, Utility Department, 1125 15th St. NW., Washington, DC 20005.

For information on training and certification programs in the cable industry, contact:

➤ Society of Cable Telecommunications Engineers, Certification Department, 140 Phillips Rd., Exton, PA 19341. Internet: **http://www.scte.org**