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# Stationary Engineers and Boiler Operators

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(O\*NET 51-8021.00)

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## Significant Points

- Workers usually acquire their skills through a formal apprenticeship program or through on-the-job training supplemented by courses at a trade or technical school.
- Most workers need to be licensed, but licensing requirements vary across the Nation.
- Employment is projected to grow slowly, and applicants may face competition for jobs.
- Opportunities will be best for workers with training in computerized controls and instrumentation.

## Nature of the Work

Most large office buildings, malls, warehouses, and other commercial facilities have extensive heating, ventilation, and air-conditioning systems that keep them comfortable all year long. Industrial plants often have additional facilities to provide electrical power, steam, or other services. Stationary engineers and boiler operators control and maintain these systems, which include boilers, air-conditioning and refrigeration equipment, diesel engines, turbines, generators, pumps, condensers, and compressors. The equipment that stationary engineers and boiler operators control is similar to equipment operated by locomotive or marine engineers, except that it is used to generate heat or electricity, rather than to move a train or ship.

Stationary engineers and boiler operators start up, regulate, repair, and shut down equipment. They ensure that the equipment operates safely, economically, and within established limits by monitoring meters, gauges, and computerized controls. Stationary engineers and boiler operators control equipment manually in many older buildings and, if necessary, make adjustments. They watch and listen to machinery and routinely check safety devices, identifying and correcting any trouble that develops.

In newer buildings, stationary engineers typically use computers to operate the mechanical, electrical, and fire safety systems. They monitor, adjust, and diagnose these systems from a central location, using a computer linked into the buildings' communications network.

Routine maintenance is a regular part of the work of stationary engineers and boiler operators. Engineers use hand and power tools to perform maintenance and repairs ranging from a complete overhaul to replacing defective valves, gaskets, or bearings. They lubricate moving parts, replace filters, and remove soot and corrosion that can reduce the boiler's operating efficiency. They also test the water in the boiler and add chemicals to prevent corrosion and harmful deposits. In most facilities, stationary engineers are responsible for the maintenance and balancing of air systems, as well as hydronic systems that heat or cool buildings by circulating fluid (such as water or water vapor) in a closed system of pipes. They may check the air quality of the ventilation system and make adjustments

to keep the operation of the boiler within mandated guidelines. Servicing, troubleshooting, repairing, and monitoring modern systems all require the use of sophisticated electrical and electronic test equipment. Additionally, many stationary engineers perform other maintenance duties, such as carpentry, plumbing, locksmithing, and electrical repairs.

Stationary engineers and boiler operators keep a record of relevant events and facts concerning the operation and maintenance of the equipment. When working with steam boilers, for example, stationary engineers and boiler operators observe, control, and record steam pressure, temperature, water level, chemistry, power output, fuel consumption, and emissions from the boiler. They also note the date and nature of all maintenance and repairs.

In a large building or industrial plant, a senior stationary engineer may be in charge of all mechanical systems in the building and may supervise a team of assistant stationary engineers, turbine operators, boiler tenders, and air-conditioning and refrigeration operators and mechanics. In a small building or industrial plant, there may be only one stationary engineer.

**Work environment.** Engine rooms, power plants, boiler rooms, mechanical rooms, and electrical rooms are usually clean and well lighted. Even under the most favorable conditions, however, some stationary engineers and boiler operators are exposed to high temperatures, dust, dirt, and high noise levels from the equipment. Maintenance duties also may require contact with oil, grease, or smoke. Workers spend much of the time on their feet. They also may have to crawl inside boilers and work in crouching or kneeling positions to inspect, clean, or repair equipment.

Stationary engineers and boiler operators work around hazardous machinery, such as low- and high-pressure boilers and electrical equipment. They must follow procedures to guard against burns, electric shock, and noise, danger from moving parts, and exposure to hazardous materials, such as asbestos or toxic chemicals.



*Stationary engineers monitor boilers and make necessary adjustments and repairs.*

## Projections data from the National Employment Matrix

| Occupational Title                             | SOC Code | Employment, 2006 | Projected employment, 2016 | Change, 2006-16 |         |
|--|----------|------------------|----------------------------|-----------------|---------|
|  |          |                  |                            | Number          | Percent |
| Stationary engineers and boiler operators..... | 51-8021  | 45,000           | 47,000                     | 1,600           | 3       |

NOTE: Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

Stationary engineers and boiler operators generally have steady, year-round employment. The average workweek is 40 hours. In facilities that operate around the clock, engineers and operators usually work one of three daily 8-hour shifts on a rotating basis. Weekend and holiday work often is required.

### Training, Other Qualifications, and Advancement

Many stationary engineers and boiler operators begin their careers in mechanic or helper positions and are trained on-the-job by more experienced engineers. Others begin by entering formal apprenticeships or training programs. After completing the required training, workers can become licensed, which allows them to work on boilers of a certain size without supervision.

**Education and training.** Most employers prefer to hire persons with at least a high school diploma or the equivalent for stationary engineers and boiler operator jobs. Workers primarily acquire their skills on the job and usually start as boiler tenders or as helpers to more experienced workers. This practical experience may be supplemented by postsecondary vocational training in subjects such as computerized controls and instrumentation. Other workers complete formal apprenticeship programs. Becoming an engineer or operator without completing a formal apprenticeship program usually requires many years of work experience.

The International Union of Operating Engineers sponsors apprenticeship programs and is the principal union for stationary engineers and boiler operators. In selecting apprentices, most local labor-management apprenticeship committees prefer applicants with a basic understanding of mathematics, science, computers, mechanical drawing, machine shop practice, and chemistry. An apprenticeship usually lasts 4 years and includes 8,000 hours of on-the-job training. In addition, apprentices receive 600 hours of classroom instruction in subjects such as boiler design and operation, elementary physics, pneumatics, refrigeration, air-conditioning, electricity, and electronics.

Continuing education—such as vocational school or college courses—is becoming increasingly important for stationary engineers and boiler operators, in part because of the growing complexity of the equipment with which engineers and operators now work. In 2006, roughly half of all stationary engineers between the ages of 25 and 44 had at least some college coursework.

Most large and some small employers encourage and pay for skill-improvement training for their employees. These employers often realize major cost savings due to greater efficiency of their workers; improved maintenance, reliability, and effective lifespan of equipment; and a better safety record. Well-trained workers manage energy better, which can also greatly reduce an employer's energy costs. Training is almost always provided when new equipment is introduced or when regulations concerning some aspect of the workers' duties change.

**Licensure.** Most States and cities have licensing requirements for stationary engineers and boiler operators. Applicants for licensure usually must be at least 18 years of age, reside for a specified period in the State or locality in which they wish to work, meet experience requirements, and pass a written examination. A stationary engineer or boiler operator who moves from one State or city to another may have to pass an examination for a new license due to regional differences in licensing requirements.

There are several classes of stationary engineer licenses. Each class specifies the type and size of equipment the engineer is permitted to operate without supervision. A licensed first-class stationary engineer is qualified to run a large facility, supervise others, and operate equipment of all types and capacities. An applicant for this license may be required to have a high school education, have completed an apprenticeship or lengthy on-the-job training, and have several years of experience working with a lower class license. Licenses below first class limit the types or capacities of equipment the engineer may operate without supervision.

**Other qualifications.** In addition to training, stationary engineers and boiler operators need mechanical aptitude and manual dexterity. Being in good physical condition is also important.

**Advancement.** Stationary engineers and boiler operators advance by being placed in charge of larger, more powerful, or more varied equipment. Generally, engineers advance to these jobs as they obtain higher class licenses. Some stationary engineers and boiler operators advance to become boiler inspectors, chief plant engineers, building and plant superintendents, or building managers. A few obtain jobs as examining engineers or technical instructors.

Because most stationary engineering staffs are relatively small, workers may find it difficult to advance, especially within a company. Most high-level positions are held by experienced workers with seniority. Workers wishing to move up to these positions must often change employers or wait for older workers to retire before they can advance.

### Employment

Stationary engineers and boiler operators held about 45,000 jobs in 2006. They worked throughout the country, generally in the more heavily populated areas in which large industrial and commercial establishments are located. Jobs were dispersed throughout a variety of industries. The majority of jobs were in State and local government, manufacturing, and hospitals.

### Job Outlook

Employment in this occupation is expected to grow more slowly than the average through 2016. Applicants may face competition for jobs. Employment opportunities will be best for those

with apprenticeship training and experience using computerized systems.

**Employment change.** Employment of stationary engineers and boiler operators is expected to grow by 3 percent between 2006 and 2016, which is more slowly than the average for all occupations. Continuing commercial and industrial development will increase the amount of equipment to be operated and maintained. However, automated systems and computerized controls are making newly installed equipment more efficient, thus reducing the number of jobs needed for its operation.

**Job prospects.** People interested in working as stationary engineers and boiler operators should expect to face competition for these relatively high-paying positions. Slow job growth coupled with the tendency of experienced workers to stay in a job for decades should continue to make openings scarce. While many workers will reach retirement age within the next decade, the number of workers who need to be replaced will be small relative to other occupations.

### Earnings

Median annual earnings of stationary engineers and boiler operators were \$46,040 in May 2006. The middle 50 percent earned between \$36,490 and \$57,380. The lowest 10 percent earned less than \$28,370, and the highest 10 percent earned more than \$68,690.

### Related Occupations

Workers who monitor and operate stationary machinery include chemical plant and system operators; gas plant operators; petroleum pump system operators, refinery operators, and gaugers; power plant operators, distributors, and dispatchers; and water and liquid waste treatment plant and system operators. Other workers who maintain the equipment and machinery in a building or plant are industrial machinery mechanics and maintenance workers, and millwrights.

### Sources of Additional Information

Information about apprenticeships, vocational training, and work opportunities is available from State employment service offices, locals of the International Union of Operating Engineers, vocational schools, and State and local licensing agencies. Apprenticeship information is also available from the U.S. Department of Labor's toll-free helpline: (877) 872-5627.

Specific questions about this occupation should be addressed to:

- International Union of Operating Engineers, 1125 17th St. NW., Washington, DC 20036. Internet: <http://www.iuoe.org>
- National Association of Power Engineers, Inc., 1 Springfield St., Chicopee, MA 01013. Internet: <http://www.powerengineers.com>
- Building Owners and Managers Institute International, 1521 Ritchie Hwy., Arnold, MD 21012. Internet: <http://www.bomi-edu.org>