

Engineer

Job Description

Engineers play a key role in the design, construction, manufacture, and operation of most today's products, buildings, and materials. They are often thought of as problem solvers who figure out, for example, how to construct a bridge or improve technology.

Most engineers specialize. There are more than 25 major specialties, some of which have numerous subdivisions. Structural and transportation engineering, for example, are subdivisions of civil engineering.

The design and construction of buildings and infrastructure projects like tunnels and airports primarily involve the work of three types of engineers. **Civil engineers** deal with the structural aspects of projects. They design and oversee the construction of buildings, bridges, roadways, and many similar facilities. **Mechanical engineers** focus on the production, transmission, and use of mechanical power and heat. They also study the behavior of materials when forces are applied to them. **Electrical engineers** design, develop, and test electrical equipment, including the machinery controls, lighting, and wiring used in buildings.

Salary

Salaries for engineers vary depending on the field of engineering. According to the National Society of Professional Engineers, the middle range of annual salaries for engineers in 2004 was as follows:

Civil	\$52,300-\$81,500
Electrical	\$58,100-\$89,800
Mechanical	\$53,600-\$83,800



ENGINEER



The average entry-level salary in 2004 for all engineers with a bachelor's degree was \$43,000. This is significantly higher than salaries for college graduates in most other fields. The average salary for senior-level engineering positions was \$100,000.

Because these salary figures are based on a national average, the salary ranges in different communities may vary from amounts mentioned above.

Education

A bachelor's degree in engineering is required for almost all entry-level engineering jobs. Most engineering degrees are granted in electrical, electronics, mechanical, or civil engineering. However, engineers trained in one branch may work in related branches. For example, many aerospace engineers have training in mechanical engineering.

Most engineering programs involve a concentration of study in an engineering specialty, along with courses in both mathematics and science. Most programs include a design course, sometimes accompanied by a computer or laboratory class or both.

In addition to the standard engineering degree, many colleges offer 2- or 4-year degree programs in engineering technology. These programs, which usually include various hands-on laboratory classes that focus on current issues, prepare students for practical design and production work, rather than for jobs that require more theoretical and scientific knowledge. Engineering technology graduates are not qualified to register as professional engineers under the same terms as graduates with degrees in engineering. Consequently, some employers regard technology program graduates as having skills between those of a technician and an engineer.

About 340 colleges and universities offer bachelor's degree programs in engineering that are approved by the Accreditation Board for Engineering and Technology, and about 240 colleges offer bachelor's degree programs in engineering technology. Some programs emphasize industrial practices, preparing students for a job in industry, whereas others are more theoretical and are designed to prepare students for graduate work.

Skills and Abilities

Engineers need to be creative, inquisitive, analytical, and detail-oriented. They should be able to work as part of a team and to communicate well, both orally and in writing. Communication abilities are important because engineers often interact with specialists in a wide range of fields outside engineering.

Job Opportunities

Overall, job opportunities in engineering are expected to be good, but will vary by specialty. A bachelor's degree is required for most entry-level jobs. Starting salaries are significantly higher than those of college graduates in other fields.

Beginning engineering graduates usually work under the supervision of experienced engineers and, in large companies, also may receive formal classroom or seminar-type training. As new engineers gain knowledge and experience, they are assigned more difficult projects with greater independence to develop designs, solve problems, and make decisions. Engineers may advance to become technical specialists or to supervise a staff or team of engineers and technicians. Some may eventually become engineering managers or enter other managerial or sales jobs.

In 2004 engineers held more than 1.4 million jobs. Three of the most popular fields were:

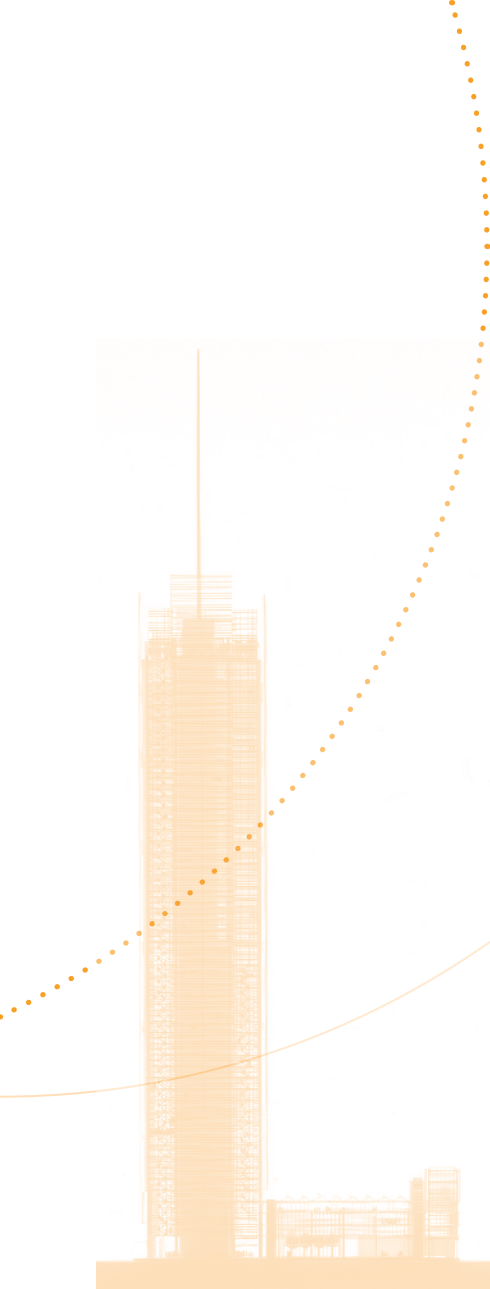
Civil	237,000
Mechanical	226,000
Electrical	156,000

Overall, job opportunities in engineering are expected to be good, but will vary by specialty. Between 2004 and 2014 the number of civil, mechanical, and electrical engineering jobs will grow overall between 9% and 17%.

Helpful High School Courses

- ▶ Mathematics: algebra, geometry, calculus, and trigonometry
- ▶ Science: biology, chemistry, and physics
- ▶ English
- ▶ Social Studies
- ▶ Computer and information technology





Resources

A number of professional organizations and web-based resources are available to high school students interested in learning about engineering careers. Among the more significant resources are the following:

▶ **American Society for Civil Engineers**

1801 Alexander Bells Drive, Reston, VA 20191

Website: <http://www.asce.org> – This rich website has extensive information about all aspects of civil engineering, as well as one section directed toward young people considering a career in this field (www.asce.org/kids).

▶ **American Society for Engineering Education**

1818 N Street NW, Suite 600, Washington, DC 20036

Website: <http://www.asee.org> – Presents information on general engineering plus career resources. Another website operated by ASEE (<http://www.engineeringk12.org>) contains much information about engineering careers that is specifically directed at junior and senior high school students.

▶ **American Society of Mechanical Engineers**

3 Park Avenue, New York, NY 10016

Website: <http://www.asme.org> – Contains sections on pre-collegiate and post-secondary education as well as a page for an early career center.

▶ **Accreditation Board for Engineering and Technology, Inc.**

111 Market Place, Suite 1050, Baltimore, MD 21202-4012

Website: <http://www.abet.org> – Provides information on accredited engineering programs.

▶ **Institute for Electrical and Electronics Engineers**

3 Park Avenue, 17th Floor, New York, NY 10016

Website: <http://www.ieee.org/web/education/preuniversity> – Offers background information about careers and links to many helpful websites.

► **Junior Engineering Technical Society (JETS)**

1420 King Street, Suite 405, Alexandria, VA 22314-2794

Website: <http://www.jets.org> – Offers a wealth of information for high school students about engineering in general, specific fields of engineering, and career guidance.

► **National Action Council for Minorities in Engineering**

440 Hamilton Avenue, Suite 301, White Plains, NY 10601

Website: <http://www.nacme.org> – NACME promotes the greater representation of minorities in engineering and engineering and technology. It provides information and scholarships. NACME's companion webpage, www.guidemenacme.org, aimed at middle and high school students, contains links to local and national organizations, online resources, and scholarship databases, plus practical pointers for parents and educators.

► **National Society of Professional Engineers**

1420 King Street, Alexandria, VA 22314-2794

Website: <http://www.nspe.org> – Contains a section directed at pre-collegiate and college students with information about careers, schools, and scholarships.

► **Sloan Career Cornerstone Center** is a virtual center providing students with extensive information about careers in science, engineering, mathematics, technology, and medicine. Most engineering fields are explained in some detail with video, audio, and other interactive components.

Website: <http://www.careerconerstone.org>



This Fact Sheet, with some additions and modifications, is taken from the National Building Museum's *Building Blocks: Design Apprenticeship Program* curriculum.