

Engineering and Natural Sciences Managers

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Significant Points

- Most engineering and natural sciences managers have previous experience as engineers, scientists, or mathematicians.
- Projected employment growth for engineering and natural sciences managers should be closely related to those for the engineers and scientists they supervise and the industries in which they are found.
- Opportunities will be best for workers with advanced technical knowledge and strong communication and business management skills.

Nature of the Work

Engineering and natural sciences managers plan, coordinate, and direct research, design, and production activities. They may supervise engineers, scientists, and technicians, along with support personnel. These managers use advanced technical knowledge of engineering and science to oversee a variety of activities. They determine scientific and technical goals within broad outlines provided by top executives, who are discussed elsewhere in the *Handbook*. These goals may include improving manufacturing processes, advancing scientific research, or developing new products. Managers make detailed plans to accomplish these goals—for example, they may develop the overall concepts of a new product or identify technical problems preventing the completion of a project.

To perform effectively, they also must possess knowledge of administrative procedures, such as budgeting, hiring, and supervision. These managers propose budgets for projects and programs and determine staff, training, and equipment needs. They hire and assign scientists, engineers, and support personnel to carry out specific parts of each project. They also supervise the work of these employees, review their output, and establish administrative procedures and policies—including environmental standards, for example.

In addition, these managers use communication skills extensively. They spend a great deal of time coordinating the activities of their unit with those of other units or organizations. They confer with higher levels of management; with financial, production, marketing, and other managers; and with contractors and equipment and materials suppliers.

Engineering managers supervise people who design and develop machinery, products, systems, and processes; or direct and coordinate production, operations, quality assurance, testing, or maintenance in industrial plants. Many are plant engineers, who direct and coordinate the design, installation, operation, and maintenance of equipment and machinery in industrial plants. Others manage research and development teams that produce new products and processes or improve existing ones.

Natural sciences managers oversee the work of life and physical scientists, including agricultural scientists, chemists, biologists, geologists, medical scientists, and physicists. These managers direct research and development projects and coordinate activities such as testing, quality control, and production. They may work on basic research projects or on commercial activities. Science managers sometimes conduct their own research in addition to managing the work of others.

Working Conditions

Engineering and natural sciences managers spend most of their time in an office. Some managers, however, also may work in laboratories, where they may be exposed to the same conditions as research scientists, or in industrial plants, where they may be exposed to the same conditions as production workers. Most managers work at least 40 hours a week and may work much longer on occasion to meet project deadlines. Some may experience considerable pressure to meet technical or scientific goals on a short deadline or within a tight budget.

Employment

Engineering and natural sciences managers held about 257,000 jobs in 2002. About 26 percent worked in professional, scientific, and technical services industries, primarily for firms providing architectural, engineering, and related services; computer systems design and related services; and scientific research and development services. Manufacturing industries employed 35 percent of engineering and natural sciences managers. Manufacturing industries with the largest employment include those producing computer and electronic equipment, machinery, transportation equipment, including aerospace products and parts, and chemicals, including pharmaceuticals. Other large employers include government agencies and telecommunications and utilities companies.

Training, Other Qualifications, and Advancement

Strong technical knowledge is essential for engineering and natural sciences managers, who must understand and guide the work of their subordinates and explain the work in nontechnical terms to senior management and potential customers. Therefore, these management positions usually require work experience and formal education similar to those of engineers, scientists, or mathematicians.

Most engineering managers begin their careers as engineers, after completing a bachelor's degree in the field. To advance to higher level positions, engineers generally must assume management responsibility. To fill management positions, employers seek engineers who possess administrative and communications skills in addition to technical knowledge in their specialty. Many engineers gain these skills by obtaining a master's degree in engineering management or a master's degree in business administration (MBA). Employers often pay for such training. In large firms, some courses required in these degree programs may be offered on site. Engineers who prefer to manage in technical areas should get a master's



Engineering and natural sciences managers provide guidance to employees and oversee day-to-day operations of the organization.

degree in engineering management, while those interested in non-technical management should get an MBA.

Many science managers begin their careers as scientists, such as chemists, biologists, geologists, or mathematicians. Most scientists or mathematicians engaged in basic research have a Ph.D.; some in applied research and other activities may have a bachelor's or master's degree. Science managers must be specialists in the work they supervise. In addition, employers prefer managers with good communication and administrative skills. Graduate programs allow scientists to augment their undergraduate training with instruction in other fields, such as management or computer technology. Given the rapid pace of scientific developments, science managers must continuously upgrade their knowledge.

Engineering and natural sciences managers may advance to progressively higher leadership positions within their discipline. Some may become managers in nontechnical areas such as marketing, human resources, or sales. In high technology firms, managers in nontechnical areas often must possess the same specialized knowledge as do managers in technical areas. For example, employers in an engineering firm may prefer to hire experienced engineers as sales workers because the complex services offered by the firm can be marketed only by someone with specialized engineering knowledge. Such sales workers could eventually advance to jobs as sales managers.

Job Outlook

Employment of engineering and natural sciences managers is expected to have average growth through the year 2012—in line with projected employment growth in engineering and most sciences. However, many additional jobs will result from the need to replace managers who retire or move into other occupations. Opportunities for obtaining a management position will be best for workers with advanced technical knowledge and strong communication skills. In addition, business management skills are important because engineering and natural sciences managers are involved in their firm's financial, production, and marketing activities.

Projected employment growth for engineering and natural sciences managers should be closely related to the growth of the occupations they supervise and the industries in which they are found. For example, opportunities for managers should be better in rapidly growing areas of engineering—such as electrical, computer, and biomedical engineering—than in more slowly growing areas of engineering or physical science, such as aerospace and petroleum engineering. (See the statements on engineers and on life and physical scientists, elsewhere in the *Handbook*.) In addition, many employers are finding it more efficient to contract engineering and science management services to outside companies and consultants, creating good opportunities for managers in management services and management, scientific, and technical consulting firms.

Earnings

Earnings for engineering and natural sciences managers vary by specialty and level of responsibility. Median annual earnings of engineering managers were \$90,930 in 2002. The middle 50 percent earned between \$72,480 and \$114,050. The lowest 10 percent earned less than \$57,840, and the highest 10 percent earned more than \$141,380. Median annual earnings in the industries employing the largest numbers of engineering managers in 2002 were:

Navigational, measuring, electromedical, and control instruments manufacturing	\$101,290
Management of companies and enterprises	98,000
Aerospace product and parts manufacturing	97,420
Federal Government	90,030
Architectural, engineering, and related services	89,520

Median annual earnings of natural sciences managers were \$82,250 in 2002. The middle 50 percent earned between \$60,000 and \$111,070. The lowest 10 percent earned less than \$45,640, and the highest 10 percent earned more than \$144,590. Median annual earnings in the industries employing the largest numbers of natural sciences managers in 2002 were:

Scientific research and development services	\$101,690
Federal Government	77,020

A survey of manufacturing firms, conducted by Abbot, Langer & Associates, found that engineering department managers and superintendents earned a median annual income of \$89,271 in 2003, while research and development managers earned \$86,412.

In addition, engineering and natural sciences managers, especially those at higher levels, often receive more benefits—such as expense accounts, stock option plans, and bonuses—than do non-managerial workers in their organizations.

Related Occupations

The work of engineering and natural sciences managers is closely related to that of engineers; mathematicians; and physical and life scientists, including agricultural and food scientists, biological and medical scientists, conservation scientists and foresters, atmospheric scientists, chemists and materials scientists, environmental scientists and geoscientists, and physicists and astronomers. It also is related to the work of other managers, especially top executives.

Sources of Additional Information

For information about a career as an engineering and natural sciences manager, contact the sources of additional information for engineers, life scientists, and physical scientists that are listed at the end of statements on these occupations elsewhere in the *Handbook*.