Engineering and Natural Sciences Managers

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Significant Points

- Most engineering and natural sciences managers have formal education and work experience as engineers, scientists, or mathematicians.
- Projected employment growth for engineering and natural sciences managers is closely related to growth in employment of the engineers and scientists they supervise and the industries in which they work.
- Opportunities will be best for workers with 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 their knowledge of engineering and natural sciences 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, these managers also must apply knowledge of administrative procedures, such as budgeting, hiring, and supervision. They 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, check the technical accuracy of their work and the soundness of their methods, 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 may supervise people who design and develop machinery, products, systems, and processes. They might also 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.

Engineering and science managers must have well-developed business and communication skills.

Work environment. 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.

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, most managers have formal education and work experience as an engineer, scientist, or mathematician.

Education and training. These managers usually have education similar to that of the workers they supervise. Most engineering managers, for example, begin their careers as engineers, after completing a bachelor's degree in the field. Many engineers gain business management skills by completing a master's degree in engineering management (MEM) or business administration (MBA). Employers often pay for such training. In large firms, some courses required in these degree programs may be offered onsite. Typically, engineers who prefer to manage in technical areas pursue an MEM, and those interested in less technical management earn an MBA.

Similarly, many science managers begin their careers as scientists, such as chemists, biologists, geologists, or mathematicians. Most scientists and mathematicians engaged in basic research have a Ph.D. degree; some who work in applied research and other activities may have a bachelor's or master's degree. Graduate programs allow scientists to augment their undergraduate training with instruction in other fields, such as management or computer technology. Natural science manag-

ers interested in more technical management may earn traditional master's or Ph.D. degrees in natural sciences or master's degrees in science that incorporate business management skills. Those interested in more general management may pursue an MBA. Given the rapid pace of scientific developments, science managers must continuously upgrade their knowledge.

Other qualifications. Engineering and natural sciences managers must be specialists in the work they supervise. To advance to these positions, engineers and scientists generally must gain experience and assume management responsibility. To fill management positions, employers seek engineers and scientists who possess administrative and communication skills in addition to technical knowledge in their specialty. In fact, because engineering and natural sciences managers must effectively lead groups and coordinate projects, they usually need excellent communication and administrative skills.

Advancement. Engineering and natural sciences managers may advance to progressively higher leadership positions within their disciplines. 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.

Employment

Engineering and natural sciences managers held about 228,000 jobs in 2006. Manufacturing industries employed 38 percent of engineering and natural sciences managers. Manufacturing industries with the largest employment are those which produce computer and electronic equipment and those which produce transportation equipment, including aerospace products and parts. Another 31 percent worked in professional, scientific, and technical services industries, primarily for firms providing architectural, engineering, and related services and firms providing scientific research and development services. Other large employers include Federal, State, and local government agencies.

Job Outlook

Employment of engineering and natural sciences managers is projected to grow about as fast as the average for all occupations, similar to the growth rate of engineers and life and physical scientists. Opportunities will be best for workers with strong communication and business management skills.

Employment change. Employment of engineering and natural sciences managers is expected to grow 8 percent over the 2006-16 decade, about as fast as the average for all occupations. Projected employment growth for engineering and natural sciences managers should be in line with growth of the engineers and scientists they supervise and the industries in which they work. Because many employers find it more efficient to contract engineering and science work to specialty firms, there should be strong demand for engineering managers in the scientific research and development services industry and for both engineering and natural science managers in the architectural, engineering, and related services industry.

Job prospects. Opportunities for engineering managers should be better in rapidly growing areas of engineering—such as environmental and biomedical engineering—than in more slowly growing areas—such as electronics and materials engineering. Opportunities for natural sciences managers should likewise be best in the rapidly growing medical and environmental sciences. (See the statements on engineers and life and physical scientists elsewhere in the *Handbook*.) Engineers and scientists with advanced technical knowledge and strong communication skills will be in the best position to become managers. Because engineering and natural sciences managers are involved in the financial, production, and marketing activities of their firm, business management skills are also advantageous for those seeking management positions. In addition to those openings resulting from employment growth, job openings will result from the need to replace managers who retire or move into other occupations.

Earnings

Earnings for engineering and natural sciences managers vary by specialty and by level of responsibility. Median annual earnings of wage and salary engineering managers were $105,430 in May 2006. The middle 50 percent earned between $84,090 and $130,170. Median annual earnings in the industries employing the largest numbers of engineering managers were:

Semiconductor and other electronic component manufacturing	$120,740
Federal executive branch	116,140
Navigational, measuring, electromedical, and control instruments manufacturing	115,150
Aerospace product and parts manufacturing	111,020
Engineering services	103,570

Median annual earnings of wage and salary natural sciences managers were $100,080 in May 2006. The middle 50 percent

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-16	
				Number	Percent
Engineering and natural sciences managers	—	228,000	246,000	18,000	8
Engineering managers	11-9041	187,000	201,000	14,000	7
Natural sciences managers	11-9121	41,000	45,000	4,600	11

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*.

earned between $77,320 and $130,900. Median annual earnings in the industries employing the largest numbers of natural sciences managers were:

Research and development in the physical, engineering, and life sciences	$120,780
Pharmaceutical and medicine manufacturing	111,070
Federal executive branch	96,100
Architectural, engineering, and related services	88,990
State government	65,570

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 nonmanagerial 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, atmospheric scientists, biological scientists, conservation scientists and foresters, chemists and materials scientists, environmental scientists and hydrologists, geoscientists, medical scientists, 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*.

Additional information on science and engineering master's degrees is available from:

➤ Commission on Professionals in Science and Technology, 1200 New York Ave. NW., Suite 113, Washington, DC 20005. Internet: **http://www.sciencemasters.org**

To learn more about managing scientists and engineers in research and development, see the *Occupational Outlook Quarterly* article, "Careers for scientists—and others—in scientific research and development," in print at many libraries and career centers. and online at**:**

http://www.bls.gov/opub/ooq/2005/summer/art04.htm