

Drafters

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Significant Points

- The type and quality of postsecondary drafting programs vary considerably; prospective students should be careful in selecting a program.
- Opportunities should be best for individuals with at least 2 years of postsecondary training in drafting and considerable skill and experience using computer-aided design and drafting (CADD) systems.
- Demand for particular drafting specialties varies geographically, depending on the needs of local industry.

Nature of the Work

Drafters prepare technical drawings and plans used by production and construction workers to build everything from manufactured products, such as toys, toasters, industrial machinery, and spacecraft, to structures, such as houses, office buildings, and oil and gas pipelines. Their drawings provide visual guidelines, show the technical details of the products and structures, and specify dimensions, materials, and procedures. Drafters fill in technical details, using drawings, rough sketches, specifications, codes, and calculations previously made by engineers, surveyors, architects, or scientists. For example, they use their knowledge of standardized building techniques to draw in the details of a structure. Some drafters use their knowledge of engineering and manufacturing theory and standards to draw the parts of a machine in order to determine design elements, such as the numbers and kinds of fasteners needed to assemble the machine. Drafters use technical handbooks, tables, calculators, and computers to complete their work.

Traditionally, drafters sat at drawing boards and used pencils, pens, compasses, protractors, triangles, and other drafting devices to prepare a drawing manually. Most drafters now use computer-aided design and drafting (CADD) systems to prepare drawings. Consequently, some drafters are referred to as *CADD operators*. CADD systems employ computer workstations to create a drawing on a video screen. The drawings are stored electronically to facilitate revisions and create duplications easily. These systems also permit drafters to quickly prepare variations of a design. Although drafters use CADD extensively, it is only a tool: Persons who produce technical drawings with CADD still function as drafters and need the knowledge of traditional drafters, in addition to CADD skills. Despite the near-universal use of CADD systems, manual drafting and sketching still is used in certain applications.

Drafting work has many specialties, and titles may denote a particular discipline of design or drafting.

Aeronautical drafters prepare engineering drawings detailing plans and specifications used in the manufacture of aircraft, missiles, and related parts.

Architectural drafters draw architectural and structural features of buildings and other structures. These workers may specialize in a type of structure, such as residential or commercial, or in a kind of material used, such as reinforced concrete, masonry, steel, or timber.

Civil drafters prepare drawings and topographical and relief maps used in major construction or civil engineering projects, such as highways, bridges, pipelines, flood control projects, and water and sewage systems.

Electrical drafters prepare wiring and layout diagrams used by workers who erect, install, and repair electrical equipment and wiring in communication centers, powerplants, electrical distribution systems, and buildings.

Electronics drafters draw wiring diagrams, circuit board assembly diagrams, schematics, and layout drawings used in the manufacture, installation, and repair of electronic devices and components.

Mechanical drafters prepare detail and assembly drawings of a wide variety of machinery and mechanical devices, indicating dimensions, fastening methods, and other requirements.

Process piping or pipeline drafters prepare drawings used in the layout, construction, and operation of oil and gas fields, refineries, chemical plants, and process piping systems.

Working Conditions

Most drafters work a standard 40-hour week; only a small number work part time. Drafters usually work in comfortable offices furnished to accommodate their tasks. They may sit at adjustable drawing boards or drafting tables when doing manual drawings, although most drafters work at computer terminals much of the time. Because they spend long periods in front of computer terminals doing detailed work, drafters may be susceptible to eyestrain, back discomfort, and hand and wrist problems.

Employment

Drafters held about 216,000 jobs in 2002. Architectural and civil drafters held about half of all jobs for drafters, mechanical drafters held about a third of all jobs, and the rest of all jobs were held by electrical and electronics drafters.

Almost half of all jobs for drafters were in architectural, engineering, and related services firms that design construction projects or do other engineering work on a contract basis for other industries. More than a quarter of jobs were in manufacturing industries, such as machinery manufacturing, including metalworking and other general machinery; fabricated metal products manufacturing, including architectural and structural metals; computer and electronic products manufacturing, in-



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cluding navigational, measuring, electromedical, and control instruments; and transportation equipment manufacturing, including aerospace products and parts manufacturing, as well as ship and boat building. Most of the rest were employed in construction, government, wholesale trade, utilities, and employment services. Only a small number were self-employed in 2002.

Training, Other Qualifications, and Advancement

Employers prefer applicants who have completed postsecondary school training in drafting, which is offered by technical institutes, community colleges, and some 4-year colleges and universities. Employers are most interested in applicants with well-developed drafting and mechanical-drawing skills; knowledge of drafting standards, mathematics, science, and engineering technology; and a solid background in computer-aided design and drafting techniques. In addition, communication and problem-solving skills are important.

Training and course work differ somewhat within the drafting specialties. The initial training for each specialty is similar. All incorporate math and communication skills, for example, but course work relating to the specialty varies. In an electronics drafting program, for example, students learn how to depict electronic components and circuits in drawings.

Many types of publicly and privately operated schools provide some form of training in drafting. The kind and quality of programs vary considerably; therefore, prospective students should be careful in selecting a program. They should contact prospective employers regarding their preferences and ask schools to provide information about the kinds of jobs that are obtained by the school's graduates, the types and conditions of the instructional facilities and equipment, and the faculty's qualifications.

Technical institutes offer intensive technical training, but less general education than do junior and community colleges. Certificates or diplomas based on the completion of a certain number of course hours may be awarded. Many technical institutes offer 2-year associate degree programs, which are similar to, or part of, the programs offered by community colleges or State university systems. Their programs vary considerably in both length and type of courses offered. Some area vocational-technical schools are postsecondary public institutions that serve local students and emphasize the type of training preferred by local employers. Many offer introductory drafting instruction. Most require a high school diploma or its equivalent for admission. Other technical institutes are run by private, often for-profit, organizations, sometimes called proprietary schools.

Community colleges offer curricula similar to those in technical institutes, but include more courses on theory and liberal arts. Often, there is little or no difference between technical institute and community college programs. However, courses taken at community colleges are more likely than those given at technical institutes to be accepted for credit at 4-year colleges. After completing a 2-year associate degree program, graduates may obtain jobs as drafters or continue their education in a related field at 4-year colleges. Most 4-year colleges usually do not offer training in drafting, but college courses in engineering, architecture, and mathematics are useful for obtaining a job as a drafter.

Technical training obtained in the Armed Forces also can be applied in civilian drafting jobs. Some additional training may be necessary, depending on the technical area or military specialty.

The American Design Drafting Association (ADDA) has established a certification program for drafters. Although employers usually do not require drafters to be certified, certification demonstrates an understanding of nationally recognized practices and standards of knowledge. Individuals who wish to become certified must pass the Drafter Certification Test, which is administered periodically at ADDA-authorized sites. Applicants are tested on their knowledge and understanding of basic drafting concepts, such as geometric construction, working drawings, and architectural terms and standards.

Individuals planning careers in drafting should take courses in mathematics, science, computer technology, design, and computer graphics, as well as any high school drafting courses available. Mechanical ability and visual aptitude also are important. Prospective drafters should be able to draw well and perform detailed work accurately and neatly. Artistic ability is helpful in some specialized fields, as is knowledge of manufacturing and construction methods. In addition, prospective drafters should have good interpersonal skills, because they work closely with engineers, surveyors, architects, other professionals, and, sometimes, customers.

Entry-level or junior drafters usually do routine work under close supervision. After gaining experience, they may become intermediate-level drafters and progress to more difficult work with less supervision. At the intermediate level, they may need to exercise more judgment and perform calculations when preparing and modifying drawings. Drafters may eventually advance to senior drafter, designer, or supervisor. Many employers pay for continuing education, and, with appropriate college degrees, drafters may go on to become engineering technicians, engineers, or architects.

Job Outlook

Employment of drafters is expected to grow more slowly than the average for all occupations through 2012. Industrial growth and increasingly complex design problems associated with new products and manufacturing processes will increase the demand for drafting services. Further, drafters are beginning to break out of the traditional drafting role and increasingly do work traditionally performed by engineers and architects, thus also increasing demand for drafters. However, the greater use of CADD equipment by drafters, as well as by architects and engineers, should limit demand for lesser skilled drafters, resulting in slower-than-average overall employment growth. Most job openings are expected to arise from the need to replace drafters who transfer to other occupations, leave the labor force, or retire.

Opportunities should be best for individuals with at least 2 years of postsecondary training in a drafting program that provides strong technical skills, as well as considerable experience with CADD systems. CADD has increased the complexity of drafting applications while enhancing the productivity of drafters. It also has enhanced the nature of drafting by creating more possibilities for design and drafting. As technology continues to advance, employers will look for drafters with a strong background in fundamental drafting principles, a higher level of technical sophistication, and an ability to apply their knowledge to a broader range of responsibilities.

Demand for particular drafting specialties varies throughout the country because employment usually is contingent upon the needs of local industry. Employment of drafters remains highly concentrated in industries that are sensitive to cyclical changes in the economy, such as manufacturing and architect-

tural and engineering services. During recessions, drafters may be laid off. However, a growing number of drafters should continue to find employment on a temporary or contract basis as more companies turn to the employment services industry to meet their changing needs.

Earnings

Earnings for drafters vary by specialty and level of responsibility. Median annual earnings of architectural and civil drafters were \$37,330 in 2002. The middle 50 percent earned between \$30,170 and \$45,500. The lowest 10 percent earned less than \$24,570, and the highest 10 percent earned more than \$56,260. Median annual earnings for architectural and civil drafters in architectural, engineering, and related services were \$36,780.

Median annual earnings of mechanical drafters were \$40,730 in 2002. The middle 50 percent earned between \$32,100 and \$51,950. The lowest 10 percent earned less than \$25,950, and the highest 10 percent earned more than \$64,780. Median annual earnings for mechanical drafters in architectural, engineering, and related services were \$41,170.

Median annual earnings of electrical and electronics drafters were \$41,090 in 2002. The middle 50 percent earned between \$32,060 and \$53,440. The lowest 10 percent earned less than \$25,710, and the highest 10 percent earned more than \$68,000. In architectural, engineering, and related services, median annual earnings for electrical and electronics drafters were \$39,760.

Related Occupations

Other workers who prepare or analyze detailed drawings and make precise calculations and measurements include architects, except landscape and naval; landscape architects; designers; engineers; engineering technicians; science technicians; and surveyors, cartographers, photogrammetrists, and surveying technicians.

Sources of Additional Information

Information on schools offering programs in drafting and related fields is available from:

► Accrediting Commission of Career Schools and Colleges of Technology, 2101 Wilson Blvd., Suite 302, Arlington, VA 22201. Internet: <http://www.accscet.org>

Information about certification is available from:

► American Design Drafting Association, 105 E. Main St., Newbern, TN 38059. Internet: <http://www.adda.org>