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## Drafters

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### Significant Points

- The type and quality of training programs vary considerably so 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 systems.
- Employment is projected to grow more slowly than average.
- Demand for drafters varies by specialty and depends on the needs of local industry.

### Nature of the Work

Drafters prepare technical drawings and plans, which are used 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.

In the past, drafters sat at drawing boards and used pencils, pens, compasses, protractors, triangles, and other drafting devices to prepare a drawing by hand. Now, most drafters use Computer Aided Design and Drafting (CADD) systems to prepare drawings. Consequently, some drafters may be referred to as *CADD operators*.

With CADD systems, drafters can create and store drawings electronically so that they can be viewed, printed, or programmed directly into automated manufacturing systems. CADD systems also permit drafters to quickly prepare variations of a design. Although drafters use CADD extensively, it is only a tool. Drafters still need knowledge of traditional drafting techniques, in addition to CADD skills. Despite the nearly universal use of CADD systems, manual drafting and sketching are used in certain applications.

Drafters' drawings provide visual guidelines and show how to construct a product or structure. Drawings include technical details and specify dimensions, materials, and procedures. Drafters fill in technical details using drawings, rough sketches, specifications, and calculations made by engineers, surveyors, architects, or scientists. For example, drafters use their knowledge of standardized building techniques to draw in the details of a structure. Some use their understanding of engineering and manufacturing theory and standards to draw the parts of a machine; they 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.

Drafting work has many specialties:

*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, power plants, 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 drawings showing the detail and assembly 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.

**Work environment.** Drafters usually work in comfortable offices. 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 computers doing detailed work, drafters may be susceptible to eyestrain, back discomfort, and hand and



*Drafters pay careful attention to detail in their technical drawings.*

wrist problems. Most drafters work a standard 40-hour week; only a small number work part time.

### **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 CADD techniques.

**Education and training.** High school courses in mathematics, science, computer technology, design, computer graphics, and, where available, drafting are useful for people considering a drafting career. Employers prefer applicants who have also completed training after high school at a technical institute, community college, or 4-year college or university.

The kind and quality of drafting training programs vary considerably so prospective students should be careful in selecting a program. They should contact prospective employers to ask which schools they prefer and contact schools to ask for information about the kinds of jobs their graduates have, the type and condition of instructional facilities and equipment, and teacher qualifications.

Technical institutes offer intensive technical training, but they provide a less general education than do community colleges. Either certificates or diplomas 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 length and in the type of courses offered. Some public vocational-technical schools serve local students and emphasize the type of training preferred by local employers. 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 courses similar to those in technical institutes but include more classes in 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 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 a 4-year college. Most 4-year colleges do not offer training in drafting, but they do offer classes in engineering, architecture, and mathematics that 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.

Training differs somewhat within the drafting specialties, although the basics, such as mathematics, are similar. In an electronics drafting program, for example, students learn how to depict electronic components and circuits in drawings. In architectural drafting, they learn the technical specifications of buildings.

**Certification and other qualifications.** Mechanical ability and visual aptitude are important for drafters. 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, and other professionals and, sometimes, with customers.

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 knowledge and an understanding of nationally recognized practices. Individuals who wish to become certified must pass the Drafter Certification Test, administered periodically at ADDA-authorized sites. Applicants are tested on basic drafting concepts, such as geometric construction, working drawings, and architectural terms and standards.

**Advancement.** Entry-level or junior drafters usually do routine work under close supervision. After gaining experience, they may become intermediate 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.

### **Employment**

Drafters held about 253,000 jobs in 2006. Architectural and civil drafters held 46 percent of all jobs for drafters, mechanical drafters held about 31 percent, and electrical and electronics drafters held about 14 percent.

About 49 percent 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. Another 25 percent 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, including 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. Approximately 5 percent were self-employed in 2006.

### **Job Outlook**

Drafters can expect slower than average employment growth through 2016, with the best opportunities expected for those with 2 years of professional training.

**Employment change.** Employment of drafters is expected to grow by 6 percent between 2006 and 2016, which is slower than the average for all occupations. Industrial growth and increasingly complex design problems associated with new products and manufacturing processes will increase the demand for drafting services. Furthermore, drafters are beginning to break out of the traditional drafting role and do work traditionally performed by engineers and architects, also increasing demand. However, drafters tend to be concentrated in slow-growing or

**Projections data from the National Employment Matrix**

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-2016	
				Number	Percent
Drafters .....	17-3010	253,000	268,000	15,000	6
Architectural and civil drafters .....	17-3011	116,000	123,000	7,000	6
Electrical and electronics drafters .....	17-3012	35,000	36,000	1,400	4
Mechanical drafters.....	17-3013	78,000	82,000	4,100	5
Drafters, all other .....	17-3019	25,000	27,000	2,700	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*.

declining manufacturing industries. In addition, CADD systems that are more powerful and easier to use are also expected to limit demand for lesser skilled drafters because simple tasks will be made easier or able to be done by other technical professionals. Employment growth also should be slowed by the offshore outsourcing to other countries of some drafting work because some drafting can be done by sending CADD files over the Internet.

Although growth is expected to be greatest for mechanical, architectural, and civil drafters, demand for particular drafting specialties varies throughout the country because employment usually is contingent on the needs of local industry.

**Job prospects.** 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 and 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 high level of technical sophistication, and the ability to apply their knowledge to a broader range of responsibilities.

Employment of drafters remains highly concentrated in industries that are sensitive to cyclical changes in the economy, primarily manufacturing industries. 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**

Drafters' earnings vary by specialty, location, and level of responsibility. Median annual earnings of architectural and civil

drafters were \$41,960 in May 2006. The middle 50 percent earned between \$33,550 and \$52,220. The lowest 10 percent earned less than \$27,010, and the highest 10 percent earned more than \$63,310.

Median annual earnings of mechanical drafters were \$43,700 in May 2006. The middle 50 percent earned between \$34,680 and \$55,130. The lowest 10 percent earned less than \$28,230, and the highest 10 percent earned more than \$67,860. Median annual earnings for mechanical drafters in architectural, engineering, and related services were \$44,120.

Median annual earnings of electrical and electronics drafters were \$46,830 in May 2006. The middle 50 percent earned between \$36,660 and \$60,160. The lowest 10 percent earned less than \$29,290, and the highest 10 percent earned more than \$74,490. In architectural, engineering, and related services, median annual earnings for electrical and electronics drafters were \$44,140.

**Related Occupations**

Other workers who prepare or analyze detailed drawings and make precise calculations and measurements include architects, except landscape and naval; landscape architects; commercial and industrial 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.accsct.org>

Information about certification is available from:

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