
Cost Estimators

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Significant Points

- About 62 percent of cost estimators work in the construction industry, and another 15 percent are employed in manufacturing industries.
- Voluntary certification can be valuable to cost estimators; some individual employers may require professional certification for employment.
- Very good employment opportunities are expected.
- In construction and manufacturing, job prospects should be best for those with industry work experience and a bachelor's degree in a related field.

Nature of the Work

Accurately forecasting the scope, cost, and duration of future projects is vital to the survival of any business. Cost estimators develop the cost information that business owners or managers need to make a bid for a contract or to decide on the profitability of a proposed new product or project. They also determine which endeavors are making a profit.

Regardless of the industry in which they work, estimators compile and analyze data on all of the factors that can influence costs, such as materials, labor, location, duration of the project, and special machinery requirements, including computer hardware and software. Job duties vary widely depending on the type and size of the project.

The methods for estimating costs can differ greatly by industry. On a construction project, for example, the estimating process begins with the decision to submit a bid. After reviewing various preliminary drawings and specifications, the estimator visits the site of the proposed project. The estimator needs to gather information on access to the site; the availability of electricity, water, and other services; and surface topography and drainage. The estimator usually records this information in a signed report that is included in the final project estimate.

After the site visit, the estimator determines the quantity of materials and labor the firm will need to furnish. This process, called the quantity survey or "takeoff," involves completing standard estimating forms, filling in dimensions, numbers of units, and other information. A cost estimator working for a general contractor, for example, estimates the costs of all of the items that the contractor must provide. Although subcontractors estimate their costs as part of their own bidding process, the general contractor's cost estimator often analyzes bids made by subcontractors. Also during the takeoff process, the estimator must make decisions concerning equipment needs, the sequence of operations, the size of the crew required, and physical constraints at the site. Allowances for wasted materials, inclement weather, shipping delays, and other factors that may increase costs also must be incorporated in the estimate.

After completing the quantity surveys, the estimator prepares a cost summary for the entire project, including the costs of labor, equipment, materials, subcontracts, overhead, taxes, insurance, markup, and any other costs that may affect the project.

The chief estimator then prepares the bid proposal for submission to the owner.

Construction cost estimators also may be employed by the project's architect or owner to estimate costs or to track actual costs relative to bid specifications as the project develops. Estimators often specialize in large construction companies employing more than one estimator. For example, one may estimate only electrical work and another may concentrate on excavation, concrete, and forms.

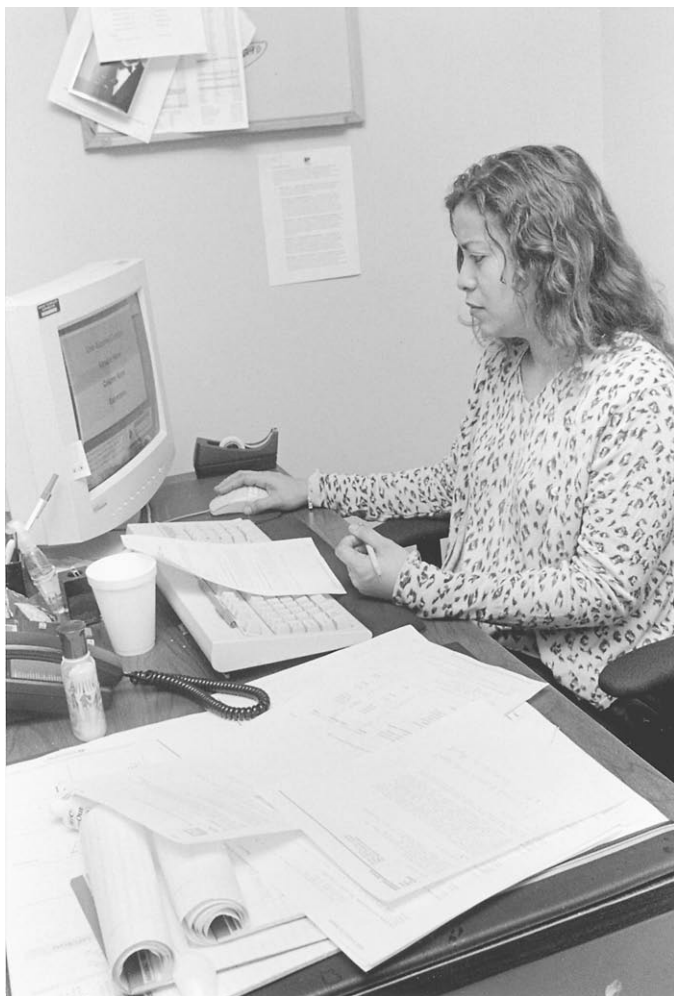
In manufacturing and other firms, cost estimators usually are assigned to the engineering, cost, or pricing department. The estimator's goal is to accurately estimate the costs associated with making products. The job may begin when management requests an estimate of the costs associated with a major redesign of an existing product or the development of a new product or production process. When estimating the cost of developing a new product, for example, the estimator works with engineers, first reviewing blueprints or conceptual drawings to determine the machining operations, tools, gauges, and materials that would be required. The estimator then prepares a parts list and determines whether it is more efficient to produce or to purchase the parts. To do this, the estimator asks for price information from potential suppliers. The next step is to determine the cost of manufacturing each component of the product. Some high-technology products require a considerable amount of computer programming during the design phase. The cost of software development is one of the fastest growing and most difficult activities to estimate. As a result, some cost estimators now specialize in estimating only computer software development and related costs.

The cost estimator then prepares time-phase charts and learning curves. Time-phase charts indicate the time required for tool design and fabrication, tool "debugging"—finding and correcting all problems—manufacturing of parts, assembly, and testing. Learning curves graphically represent the rate at which the performance of workers producing parts for the new product improves with practice. These curves are commonly called "cost reduction" curves, because many problems—such as engineering changes, rework, shortages of parts, and lack of operator skills—diminish as the number of units produced increases, resulting in lower unit costs.

Using all of this information, the estimator then calculates the standard labor hours necessary to produce a specified number of units. Standard labor hours are then converted to dollar values, to which are added factors for waste, overhead, and profit to yield the unit cost in dollars. The estimator then compares the cost of purchasing parts with the firm's estimated cost of manufacturing them to determine which is cheaper.

Computers play an integral role in cost estimation because estimating often involves complex mathematical calculations and requires advanced mathematical techniques. For example, to undertake a parametric analysis (a process used to estimate costs per unit based on square footage or other specific requirements of a project), cost estimators use a computer database containing information on the costs and conditions of many other similar projects. Although computers cannot be used for the entire estimating process, they can relieve estimators of much of the drudgery associated with routine, repetitive, and time-consuming calculations. New and improved cost estimating software has led to more efficient computations, leaving estimators greater time to visit and analyze projects.

Operations research, production control, cost, and price analysts who work for government agencies may do significant



Cost estimators analyze data on factors that influence costs to determine whether a contract is viable.

amounts of cost estimating in the course of their regular duties. In addition, the duties of construction managers may include estimating costs. (For more information, see the statements on operations research analysts and construction managers elsewhere in the *Handbook*.)

Work environment. Although estimators spend most of their time in a comfortable office, construction estimators also visit worksites that can be dusty, dirty, and occasionally hazardous. Likewise, estimators in manufacturing spend time on the factory floor, where it also can be noisy and dirty. In some industries, frequent travel between a firm's headquarters and its subsidiaries or subcontractors may be required.

Estimators normally work a 40-hour week, but overtime is common. Cost estimators often work under pressure and stress, especially when facing bid deadlines. Inaccurate estimating can cause a firm to lose a bid or to lose money on a job that was not accurately estimated.

Training, Other Qualifications, and Advancement

Job entry requirements for cost estimators vary by industry. In the construction industry, employers increasingly prefer to hire cost estimators with a bachelor's degree in construction science, construction management, or building science, although it is also possible for experienced construction workers to become cost estimators. Employers in manufacturing usually prefer someone with a bachelor's degree in mathematics, statistics, or engineering.

Education and training. In the construction industry, employers increasingly prefer individuals with a degree in building science, construction management, or construction science, all of which usually include several courses in cost estimating. Most construction estimators also have considerable construction experience, gained through work in the industry, internships, or cooperative education programs. Applicants with a thorough knowledge of construction materials, costs, and procedures in areas ranging from heavy construction to electrical work, plumbing systems, or masonry work have a competitive edge.

In manufacturing industries, employers prefer to hire individuals with a degree in engineering, physical science, operations research, mathematics, or statistics or in accounting, finance, business, economics, or a related subject. In most industries, experience in quantitative techniques is important.

Many colleges and universities include cost estimating as part of bachelor's and associate degree curriculums in civil engineering, industrial engineering, and construction management or construction engineering technology. In addition, cost estimating is often part of master's degree programs in construction science or construction management. Organizations representing cost estimators, such as the Association for the Advancement of Cost Engineering (AACE International) and the Society of Cost Estimating and Analysis (SCEA), also sponsor educational and professional development programs. These programs help students, estimators-in-training, and experienced estimators learn about changes affecting the profession. Specialized courses and programs in cost-estimating techniques and procedures also are offered by many technical schools, community colleges, and universities.

Estimators also receive much training on the job because every company has its own way of handling estimates. Working with an experienced estimator, newcomers become familiar with each step in the process. Those with no experience reading construction specifications or blueprints first learn that aspect of the work. Then they may accompany an experienced estimator to the construction site or shop floor, where they observe the work being done, take measurements, or perform other routine tasks. As they become more knowledgeable, estimators learn how to tabulate quantities and dimensions from drawings and how to select the appropriate prices for materials.

Other qualifications. Cost estimators should have an aptitude for mathematics; be able to quickly analyze, compare, and interpret detailed but sometimes poorly defined information; and be able to make sound and accurate judgments based on this information. The ability to focus on details, while analyzing and overcoming larger obstacles, is essential. Assertiveness and self-confidence in presenting and supporting conclusions are also important, as are strong communications and interpersonal skills, because estimators may work as part of a team alongside managers, owners, engineers, and design professionals. Cost estimators also need knowledge of computers, including word-processing and spreadsheet packages. In some instances, familiarity with special estimation software or programming skills also may be required.

Certification and advancement. Voluntary certification can be valuable to cost estimators because it provides professional recognition of the estimator's competence and experience. In some instances, individual employers may even require professional certification for employment. Both AACE International

and SCEA administer certification programs. To become certified, estimators usually must have between 2 and 8 years of estimating experience and must pass an examination. In addition, certification requirements may include the publication of at least one article or paper in the field.

For most estimators, advancement takes the form of higher pay and prestige. Some move into management positions, such as project manager for a construction firm or manager of the industrial engineering department for a manufacturer. Others may go into business for themselves as consultants, providing estimating services for a fee to government or to construction or manufacturing firms.

Employment

Cost estimators held about 221,000 jobs in 2006. About 62 percent of estimators were in the construction industry, and another 15 percent were employed in manufacturing. The remainder worked in a wide range of other industries.

Cost estimators work throughout the country, usually in or near major industrial, commercial, and government centers and in cities and suburban areas undergoing rapid change or development.

Job Outlook

Employment of cost estimators is expected to grow faster than average. Very good employment opportunities are expected.

Employment change. Employment is expected to grow by 19 percent between 2006 and 2016, which is faster than the average for all occupations. Employment growth in the construction industry, in which most cost estimators are employed, will account for the majority of new jobs in this occupation. Construction and repair of highways, streets, bridges, subway systems, airports, water and sewage systems, and electric power plants and transmission lines will stimulate demand for many more cost estimators. Similarly, increasing population and business growth will result in more construction of residential homes, office buildings, shopping malls, hospitals, schools, restaurants, and other structures that require cost estimators. As the population ages, the demand for nursing and extended-care facilities will also increase. The growing complexity of construction projects will also boost demand for cost estimators as a larger number of workers specialize in a particular area of construction.

Job prospects. Because there are no formal bachelor's degree programs in cost estimating, some employers have difficulty recruiting qualified cost estimators, resulting in very good employment opportunities. Job prospects in construction should be best for those who have a degree in construction science, construction management, or building science plus practical experience in the various phases of construction or in a specialty craft area. For cost estimating jobs in manufacturing, those with degrees in mathematics, statistics, engineering, accounting, business administration, or economics should have the best job prospects.

In addition to job openings arising from employment growth, many additional openings should result annually from the need to replace workers who transfer to other occupations due to the sometimes stressful nature of the work, or who retire or leave the occupation for other reasons.

Employment of cost estimators, like that of many other construction workers, is sensitive to the fluctuations of the economy. Workers in these trades may experience periods of unemployment when the overall level of construction falls. On the other hand, shortages of these workers may occur in some areas during peak periods of building activity.

Earnings

Salaries of cost estimators vary widely by experience, education, size of firm, and industry. Median annual earnings of wage and salary cost estimators in May 2006 were \$52,940. The middle 50 percent earned between \$40,320 and \$69,460. The lowest 10 percent earned less than \$31,600, and the highest 10 percent earned more than \$88,310. Median annual earnings in the industries employing the largest numbers of cost estimators were:

Nonresidential building construction	\$60,870
Building equipment contractors	56,170
Foundation, structure, and building exterior contractors	52,520
Residential building construction.....	52,460
Building finishing contractors.....	51,610

According to a July 2007 salary survey by the National Association of Colleges and Employers, those with bachelor's degrees in construction science/management received job offers averaging \$46,930 a year.

Related Occupations

Other workers who quantitatively analyze information include accountants and auditors; budget analysts; claims adjusters, appraisers, examiners, and investigators; economists; financial analysts and personal financial advisors; insurance underwriters; loan officers; market and survey researchers; and operations research analysts. In addition, the duties of industrial production managers and construction managers also may involve analyzing costs.

Sources of Additional Information

Information about career opportunities, certification, educational programs, and cost-estimating techniques may be obtained from the following organizations:

- Association for the Advancement of Cost Engineering (AACE International), 209 Prairie Ave., Suite 100, Morgantown, WV 26501. Internet: <http://www.aacei.org>
- Society of Cost Estimating and Analysis, 527 Maple Ave. East, Suite 301, Vienna, VA 22180. Internet: <http://www.sceonline.net>

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-16	
				Number	Percent
Cost estimators.....	13-1051	221,000	262,000	41,000	19

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*.