
Structural and Reinforcing Iron and Metal Workers

(O*NET 47-2171.00, 47-2221.00)

Significant Points

- Workers must be in good physical condition and must not fear heights.
- Most employers recommend completion of a formal 3-year or 4-year apprenticeship, but some workers learn on the job.
- Earnings of structural iron and steel workers are among the highest of all construction trades.
- In most areas, job opportunities should be excellent.

Nature of the Work

Structural and reinforcing iron and metal workers place and install iron or steel girders, columns, and other construction materials to form buildings, bridges, and other structures. They also position and secure steel bars or mesh in concrete forms in order to reinforce the concrete used in highways, buildings, bridges, tunnels, and other structures. In addition, they repair and renovate older buildings and structures. Even though the primary metal involved in this work is steel, these workers often are known as *ironworkers* or *erectors*. Some ironworkers make structural metal in fabricating shops, which are usually located away from the construction site. These workers are covered in the statement on assemblers and fabricators found elsewhere in the *Handbook*.

Before construction can begin, ironworkers must erect steel frames and assemble the cranes and derricks that move structural steel, reinforcing bars, buckets of concrete, lumber, and other materials and equipment around the construction site. Once this job has been completed, workers begin to connect steel columns, beams, and girders according to blueprints and instructions from supervisors and superintendents. Structural steel, reinforcing rods, and ornamental iron generally come to the construction site ready for erection—cut to the proper size, with holes drilled for bolts and numbered for assembly.

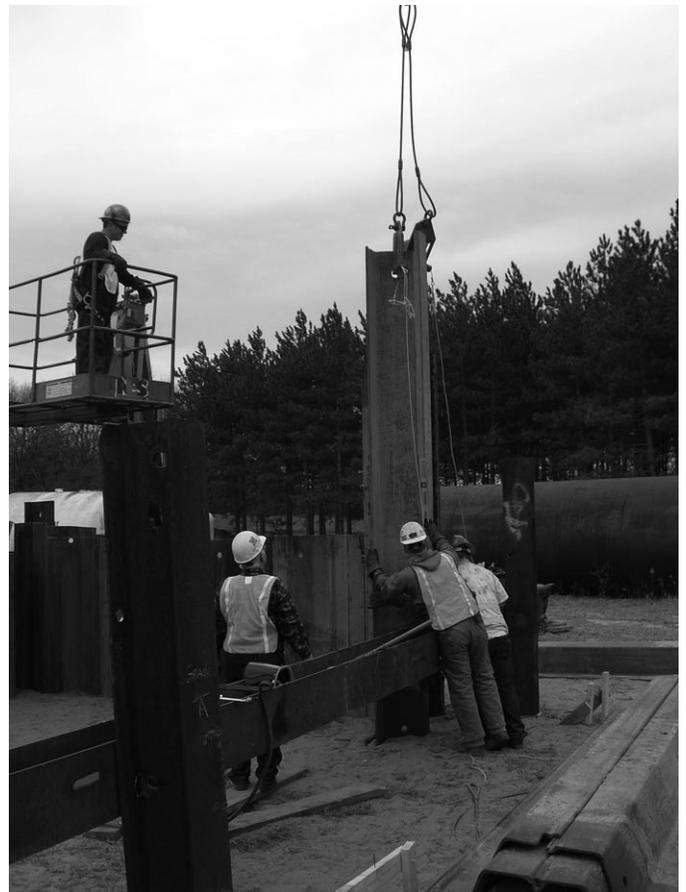
Ironworkers at the construction site unload and stack the pre-fabricated steel so that it can be hoisted easily when needed. To hoist the steel, ironworkers attach cables (slings) to the steel and to the crane or derrick. One worker directs the hoist operator with hand signals while another worker holds a rope (tag line) attached to the steel to prevent it from swinging. The crane or derrick hoists steel into place in the framework, whereupon two ironworkers called connectors position the steel with connecting bars and spud wrenches—a long wrench with a pointed handle. Workers using driftpins or the handle of a spud wrench align the holes in the steel with the holes in the framework. Ironworkers check vertical and horizontal alignment with plumb bobs, laser equipment, transits, or levels; then they bolt or weld the piece permanently in place.

Reinforcing iron and rebar workers, sometimes called rod busters, set reinforcing bars (often called rebar) in the forms that hold concrete, following blueprints showing the location, size, and number of bars. They then fasten the bars together by

tying wire around them with pliers. When reinforcing floors, ironworkers place spacers under the rebar to hold the bars off the deck. Although these materials usually arrive ready to use, ironworkers occasionally must cut bars with metal shears or acetylene torches, bend them by hand or machine, or weld them with arc-welding equipment. Some concrete is reinforced with welded wire fabric that ironworkers put into position using hooked rods. Post-tensioning is another technique used to reinforce concrete. In this technique, workers substitute cables for rebar. When the concrete is poured, the ends of the cables are left exposed. After the concrete cures, ironworkers tighten the cables with jacking equipment specially designed for the purpose. Post-tensioning allows designers to create larger open areas in a building, because supports can be placed further apart. This technique is commonly employed in parking garages and arenas.

Ornamental ironworkers install stairs, handrails, curtain walls (the nonstructural walls and window frames of many large buildings), and other miscellaneous metal after the structure of the building has been completed. As they hoist pieces into position, ornamental ironworkers make sure that the pieces are properly fitted and aligned before bolting or welding them for a secure fit.

Work environment. Structural and reinforcing iron and metal workers usually work outside in all kinds of weather. However, those who work at great heights do not work during wet, icy, or extremely windy conditions. Because the danger of injuries from falls is great, ironworkers use safety devices such as safety harnesses, scaffolding, and nets to reduce risk.



Earnings of structural iron and steel workers are among the highest of all construction trades.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-16	
				Number	Percent
Structural and reinforcing iron and metal workers	—	102,000	110,000	7,800	8
Reinforcing iron and rebar workers	47-2171	30,000	34,000	3,500	12
Structural iron and steel workers	47-2221	72,000	76,000	4,300	6

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*.

Training, Other Qualifications, and Advancement

Many workers learn to be ironworkers through formal apprenticeships, but others learn on the job less formally. Certifications in welding and rigging can increase a worker's usefulness on the job site.

Education and training. Most employers recommend a 3- or 4-year apprenticeship consisting of paid on-the-job training and evening classroom instruction as the best way to learn this trade. Apprenticeship programs are administered by committees made up of representatives of local unions of the International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers or the local chapters of contractors' associations.

In the classroom, apprentices study blueprint reading; mathematics, the basics of structural erecting, rigging, reinforcing, welding, assembling, and safety training. Apprentices also study the care and safe use of tools and materials. On the job, apprentices work in all aspects of the trade, such as unloading and storing materials at the job site, rigging materials for movement by crane, connecting structural steel, and welding.

Some ironworkers learn the trade informally on the job, without completing an apprenticeship. These workers generally do not receive classroom training, although some large contractors have extensive training programs. On-the-job trainees usually begin by assisting experienced ironworkers on simple jobs, such as carrying various materials. With experience, trainees perform more difficult tasks, such as cutting and fitting different parts; however, learning through work experience alone may not provide training as complete as an apprenticeship program, and it usually takes longer.

Other qualifications. Ironworkers must be at least 18 years old. A high school diploma is preferred by employers and local apprenticeship committees. High school courses in general mathematics, mechanical drawing, English, and welding are considered helpful. Because materials used in iron working are heavy and bulky, ironworkers must be in good physical condition. They also need good agility, balance, eyesight, and depth perception to work safely at great heights on narrow beams and girders. Ironworkers should not be afraid of heights or suffer from dizziness.

Certification and advancement. Ironworkers who complete apprenticeships are certified as journey workers, which often make them more competitive for jobs and promotions. Those who meet education and experience requirements can become welders certified by the American Welding Society. Apprenticeship programs often provide trainees the opportunity to become certified as part of their coursework because welding skills are useful for many ironworker tasks.

Some experienced workers are promoted to supervisor. Others may go into the contracting business for themselves. The

ability to communicate in both English and Spanish will improve opportunities for advancement.

Employment

Ironworkers held about 102,000 jobs in 2006; structural iron and steel workers held about 72,000 jobs; and reinforcing iron and rebar workers held about 30,000 jobs. About 88 percent worked in construction, with 50 percent working for foundation, structure, and building exterior contractors. Most of the remaining ironworkers worked for contractors specializing in the construction of homes; factories; commercial buildings; religious structures; schools; bridges and tunnels; and water, sewer, communications, and power lines.

Structural and reinforcing iron and metal workers are employed in all parts of the country, but most work in metropolitan areas, where the bulk of commercial and industrial construction takes place.

Job Outlook

Average job growth is projected, but in most areas of the country job opportunities should be excellent.

Employment change. Employment of structural and reinforcing iron and metal workers is expected to grow 8 percent between 2006 and 2016, about as fast as the average for all occupations. Nonresidential and heavy construction is expected to increase, creating jobs. The rehabilitation, maintenance, and replacement of a growing number of older buildings, powerplants, highways, and bridges also are expected to create employment opportunities. State and Federal legislatures continue to support and fund the building of roads, which will secure jobs for the near future. However, a lack of qualified applicants may restrain employment growth in some areas.

Job prospects. In addition to new jobs from employment growth, many job openings will result from the need to replace experienced ironworkers who leave the occupation or retire. In most areas, job opportunities should be excellent, although the number of job openings can fluctuate from year to year with economic conditions and the level of construction activity. Many workers prefer to enter other occupations with better working conditions, leading to opportunities for those who wish to become structural and reinforcing iron and metal workers.

Employment of structural and reinforcing iron and metal workers, 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. Similarly, job opportunities for ironworkers may vary widely by geographic area. Population growth in

the South and West should create more job opportunities than elsewhere as bridges, buildings, and roads are constructed. Job openings for ironworkers usually are more abundant during the spring and summer months, when the level of construction activity increases. Workers who are willing to relocate are often able to find work in another area.

Earnings

Earnings of structural iron and steel workers are among the highest of all construction trades. In May 2006, median earnings of wage and salary structural iron and steel workers in all industries were \$19.46 an hour. The middle 50 percent earned between \$14.11 and \$27.08. The lowest 10 percent earned less than \$10.94, and the highest 10 percent earned more than \$34.78.

Median hourly earnings of wage and salary reinforcing iron and rebar workers in all industries were \$18.38. The middle 50 percent earned between \$13.15 and \$27.03. The lowest 10 percent earned less than \$10.25, and the highest 10 percent earned more than \$34.15.

Median hourly earnings of wage and salary structural iron and steel workers in foundation, structure, and building exterior contractors were \$20.54 and in nonresidential building construction, \$16.76. Reinforcing iron and rebar workers earned median hourly earnings of \$18.67 in foundation, structure, and building exterior contractors.

About 31 percent of the workers in this trade are union members. According to International Association of Bridge, Structural, Ornamental, and Reinforcing Iron Workers, average hourly earnings, including benefits, for structural and reinforcing metal workers who belonged to a union and worked full time were slightly higher than the hourly earnings of nonunion workers. Structural and reinforcing iron and metal workers in New York, Boston, San Francisco, Chicago, Los Angeles, Philadelphia, and other large cities received the highest wages.

Apprentices generally start at about 50 to 60 percent of the rate paid to experienced journey workers. Throughout the course of the apprenticeship program, as they acquire skills, they receive periodic increases until their pay approaches that of experienced workers.

Earnings for ironworkers may be reduced on occasion because work can be limited by bad weather, the short-term nature of construction jobs, and economic downturns.

Related Occupations

Structural and reinforcing iron and metal workers play an essential role in erecting buildings, bridges, highways, power lines, and other structures. Others who work on these construction jobs include assemblers and fabricators; boilermakers; civil engineers; cement masons, concrete finishers, segmental pavers, and terrazzo workers; construction managers; and welding, soldering, and brazing workers.

Sources of Additional Information

For more information on apprenticeships or other work opportunities, contact local general contractors; a local of the International Association of Bridge, Structural, Ornamental, and Reinforcing Iron Workers Union; a local ironworkers' joint union-management apprenticeship committee; a local or State chapter of the Associated Builders and Contractors or the Associated General Contractors; or the nearest office of your State employment service or apprenticeship agency. You can also find information on the registered apprenticeship system with links to State apprenticeship programs on the U.S. Department of Labor's Web site: http://www.doleta.gov/atels_bat Apprenticeship information is also available from the U.S. Department of Labor's toll free helpline: 1 (877) 872-5627.

For apprenticeship information, contact

► International Association of Bridge, Structural, Ornamental, and Reinforcing Iron Workers, Apprenticeship Department, 1750 New York Ave. NW., Suite 400, Washington, DC 20006. Internet: <http://www.ironworkers.org>

For general information about ironworkers, contact either of the following sources:

► Associated Builders and Contractors, Workforce Development Department, 4250 North Fairfax Dr., 9th Floor, Arlington, VA 22203. Internet: <http://www.trytools.org>

► Associated General Contractors of America, Inc., 2300 Wilson Blvd., Suite 400., Arlington, VA 22201.

Internet: <http://www.agc.org>

For general information on apprenticeships and how to get them, see the *Occupational Outlook Quarterly* article "Apprenticeships: Career training, credentials—and a paycheck in your pocket," in print at many libraries and career centers and online at: <http://www.bls.gov/opub/ooq/2002/summer/art01.pdf>