

Job Outlook

Employment of boilermakers is expected to show little or no change through the year 2010. Most job openings will result from the need to replace experienced workers who leave this small occupation. Growth should be limited by the trend toward repairing and retrofitting, rather than replacing, existing boilers; the use of small boilers, which require less on-site assembly; and automation of production technologies.

Most industries that purchase boilers are sensitive to economic conditions. Therefore, during economic downturns, construction boilermakers may be laid off. However, because maintenance and repairs of boilers must continue even during economic downturns, boilermaker mechanics generally have stable employment.

Earnings

In 2000, the median hourly earnings of boilermakers were about \$17.80. The middle 50 percent earned between \$14.06 and \$23.19. The lowest 10 percent earned less than \$9.60 and the highest 10 percent earned more than \$26.81. Apprentices generally start at about 60 percent of journey wages, with wages gradually increasing to the journey wage as progress is made in the apprenticeship.

Almost one-half of all boilermakers belong to labor unions. The principal union is the International Brotherhood of Boilermakers. Other boilermakers are members of the International Association of Machinists, the United Automobile Workers, or the United Steelworkers of America.

Related Occupations

Workers in a number of other occupations assemble, install, or repair metal equipment or machines. These occupations include assemblers and fabricators; machinists; industrial machinery installation, repair, and maintenance workers; pipelayers, plumbers, pipefitters, and steamfitters; sheet metal workers; tool and die makers; and welding, soldering, and brazing workers.

Sources of Additional Information

For further information regarding boilermaking apprenticeships or other training opportunities, contact local offices of the unions previously mentioned, local construction companies and boiler manufacturers, or the local office of your State Employment Service.

For information on apprenticeships and the boilermaking occupation, contact:

► International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers, and Helpers, 753 State Ave., Suite 570, Kansas City, KS 66101. Internet: <http://www.boilermakers.org>

Brickmasons, Blockmasons, and Stonemasons

(O*NET 47-2021.00, 47-2022.00)

Significant Points

- Job prospects are expected to be excellent.
- Most entrants learn informally on the job, but apprenticeship programs provide the most thorough training.
- Work is usually outdoors and involves lifting heavy bricks and blocks and working on scaffolds.
- Nearly 3 out of 10 are self-employed.

Nature of the Work

Brickmasons, blockmasons, and stonemasons work in closely related trades creating attractive, durable surfaces and structures. The work varies in complexity, from laying a simple masonry walkway to installing an ornate exterior on a high-rise building. *Brickmasons* and *blockmasons*—who often are referred to simply as bricklayers—build and repair walls, floors, partitions, fireplaces, chimneys, and other structures with brick, precast masonry panels, concrete block, and other masonry materials. Additionally, brickmasons specialize in installing firebrick linings in industrial furnaces. *Stonemasons* build stone walls, as well as set stone exteriors and floors. They work with two types of stone—natural cut, such as marble, granite, and limestone; and artificial stone made from concrete, marble chips, or other masonry materials. Stonemasons usually work on nonresidential structures, such as houses of worship, hotels, and office buildings.

When building a structure, brickmasons use one of two methods, the corner lead or the corner pole. Using the corner lead method, they begin by constructing a pyramid of bricks at each corner—called a lead. After the corner leads are complete, less experienced brickmasons fill in the wall between the corners, using a line from corner to corner to guide each *course*, or layer, of brick. Due to the precision needed, corner leads are time-consuming to erect and require the skills of experienced bricklayers.

Because of the expense associated with building corner leads, most brickmasons use corner poles, also called masonry guides, that enable them to build an entire wall at the same time. They fasten the corner poles (posts) in a plumb position to define the wall line and stretch a line between them. This line serves as a guide for each course of brick. Brickmasons then spread a bed of mortar (a cement, sand, and water mixture) with a trowel (a flat, bladed metal tool with a handle), place the brick on the mortar bed, and press and tap the brick into place. Depending on blueprint specifications, brickmasons either cut bricks with a hammer and chisel or saw them to fit around windows, doors, and other openings. Mortar joints are then finished with jointing tools for a sealed, neat, uniform appearance. Although brickmasons usually use steel supports, or *lintels*, at window and door openings, they sometimes build brick arches instead, which support and enhance the beauty of the brickwork.

Stonemasons often work from a set of drawings, in which each stone has been numbered for identification. Helpers may locate and carry these prenumbered stones to the masons. A derrick operator using a hoist may be needed to lift large stone pieces into place.

When building a stone wall, masons set the first course of stones into a shallow bed of mortar. They then align the stones with wedges, plumb lines, and levels, and adjust them into position with a hard rubber mallet. Masons continue to build the wall by alternating layers of mortar and courses of stone. As the work progresses, masons remove the wedges, fill the joints between stones, and use a pointed metal tool, called a tuck pointer, to smooth the mortar to an attractive finish. To hold large stones in place, stonemasons attach brackets to the stone and weld or bolt these brackets to anchors in the wall. Finally, masons wash the stone with a cleansing solution to remove stains and dry mortar.

When setting stone floors, which often consist of large and heavy pieces of stone, masons first use a trowel to spread a layer of damp mortar over the surface to be covered. Using crowbars and hard rubber mallets for aligning and leveling, they then set the stone in the mortar bed. To finish, workers fill the joints and wash the stone slabs.

Masons use a special hammer and chisel to cut stone. They cut stone along the grain to make various shapes and sizes, and valuable pieces often are cut with a saw that has a diamond blade. Some



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masons specialize in setting marble which, in many respects, is similar to setting large pieces of stone. Brickmasons and stonemasons also repair imperfections and cracks, and replace broken or missing masonry units in walls and floors.

Most nonresidential buildings now are built with walls made of concrete block, brick veneer, stone, granite, marble, tile, or glass. In the past, brickmasons and blockmasons doing nonresidential interior work mostly built block partition walls and elevator shafts. Now, these workers must be more versatile and work with many materials. For example, some brickmasons and blockmasons now install structural insulated wall panels and masonry accessories used in many high-rise buildings.

Refractory masons are brickmasons who specialize in installing firebrick and refractory tile in high-temperature boilers, furnaces, cupolas, ladles, and soaking pits in industrial establishments. Most of these workers work in steel mills, where molten materials flow on refractory beds from furnaces to rolling machines.

Working Conditions

Brickmasons, blockmasons, and stonemasons usually work outdoors and are exposed to the elements. They stand, kneel, and bend for long periods and often have to lift heavy materials. Common hazards include injuries from tools and falls from scaffolds, but these can often be avoided when proper safety practices are followed.

Employment

Brickmasons, blockmasons, and stonemasons held about 158,000 jobs in 2000. The vast majority were brickmasons. Workers in these crafts are employed primarily by building, special trade, or general contractors. Brickmasons, blockmasons, and stonemasons work throughout the country but, like the general population, are concentrated in metropolitan areas.

Nearly 3 out of 10 brickmasons, blockmasons, and stonemasons are self-employed. Many of the self-employed specialize in contracting small jobs, such as patios, walkways, and fireplaces.

Training, Other Qualifications, and Advancement

Most brickmasons, blockmasons, and stonemasons pick up their skills informally, observing and learning from experienced workers. Many others receive training in vocational education schools or from industry-based programs that are common throughout the country. Another way to learn these skills is through an apprenticeship program, which generally provides a thorough training.

Individuals who learn the trade on the job usually start as helpers, laborers, or mason tenders. These workers carry materials, move scaffolds, and mix mortar. When the opportunity arises, they learn from experienced craftworkers how to spread mortar, lay brick and block, or set stone. As they gain experience, they make the transition to full-fledged craftworkers. The learning period on the job normally lasts longer than an apprenticeship program. Industry-based programs offered through companies usually last between 2 and 4 years.

Apprenticeships for brickmasons, blockmasons, and stonemasons usually are sponsored by local contractors or by local union-management committees. The apprenticeship program requires 3 years of on-the-job training, in addition to a minimum 144 hours of classroom instruction each year in subjects such as blueprint reading, mathematics, layout work, and sketching.

Apprentices often start by working with laborers, carrying materials, mixing mortar, and building scaffolds. This period generally lasts about a month and familiarizes the apprentice with job routines and materials. Next, they learn to lay, align, and join brick and block. Apprentices also learn to work with stone and concrete, which enables them to be certified to work with more than one masonry material.

Applicants for apprenticeships must be at least 17 years old and in good physical condition. A high school education is preferable; and courses in mathematics, mechanical drawing, and shop are helpful. The International Masonry Institute (IMI), a joint trust of the International Union of Bricklayers and Allied Craftworkers and the contractors who employ its members, operates training centers in several large cities that help jobseekers develop the skills needed to successfully complete the formal apprenticeship program. In view of the shortage of entrants, IMI has expanded these centers in recent years to recruit and train workers before they enter apprenticeship programs. In addition, the IMI has a national training and education center at Fort Ritchie, MD. The national center's programs teach basic job skills for brick, stone, tile, terrazzo, refractory, and restoration work, as well as safety and scaffolding training.

Bricklayers who work in nonresidential construction usually work for large contractors and receive well-rounded training—normally through apprenticeship in all phases of brick or stone work. Those who work in residential construction usually work primarily for small contractors and specialize in only one or two aspects of the job.

Often, experienced workers can advance to supervisory positions or become estimators. They also can open contracting businesses of their own.

Job Outlook

Job opportunities for brickmasons, blockmasons, and stonemasons are expected to be excellent through 2010—largely due to the numerous openings arising each year as experienced workers leave the occupation. In addition, many potential workers prefer to work under less strenuous, more comfortable conditions. Well trained workers will have especially favorable opportunities.

Employment of brickmasons, blockmasons, and stonemasons is expected to increase about as fast as the average for all occupations over the 2000-10 period as population and business growth create a need for new houses, industrial facilities, schools, hospitals, offices, and other structures. Also stimulating demand will be the need to restore a growing stock of old masonry buildings, as well as the increasing use of brick and stone for decorative work on building fronts and in lobbies and foyers. Brick exteriors should continue to be very popular, as the trend continues toward durable exterior materials requiring little maintenance. However, employment of bricklayers who specialize in refractory repair will decline, along with employment in other occupations in the primary metal

industries. In addition, many openings will result from the need to replace brickmasons, blockmasons, and stonemasons who retire, transfer to other occupations, or leave these trades for other reasons.

Employment of brickmasons, blockmasons, and stonemasons, like that of many other construction workers, is sensitive to changes in the economy. When the level of construction activity falls, workers in these trades can experience periods of unemployment.

Earnings

Median hourly earnings of brickmasons and blockmasons in 2000 were \$19.37. The middle 50 percent earned between \$15.00 and \$24.48. The lowest 10 percent earned less than \$11.20, and the highest 10 percent earned more than \$30.02. Median hourly earnings in the industries employing the largest number of brickmasons in 2000 are shown below:

Miscellaneous special trade contractors	\$22.87
Masonry, stonework, and plastering	19.55
Nonresidential building construction	19.02
Residential building construction	18.10

Median hourly earnings of stonemasons in 2000 were \$14.98. The middle 50 percent earned between \$10.78 and \$19.24. The lowest 10 percent earned less than \$9.09, and the highest 10 percent earned more than \$23.03.

Earnings for workers in these trades can be reduced on occasion because poor weather and downturns in construction activity limit the time they can work.

Apprentices or helpers usually start at about 50 percent of the wage rate paid to experienced workers. Pay increases as apprentices gain experience and learn new skills.

Some brickmasons, blockmasons, and stonemasons are members of the International Union of Bricklayers and Allied Craftworkers.

Related Occupations

Brickmasons, blockmasons, and stonemasons combine a thorough knowledge of brick, concrete block, stone, and marble with manual skill to erect attractive, yet highly durable, structures. Workers in other occupations with similar skills include carpet, floor, and tile installers and finishers; cement masons, concrete finishers, segmental pavers, and terrazzo workers; and plasterers and stucco masons.

Sources of Additional Information

For details about apprenticeships or other work opportunities in these trades, contact local bricklaying, stonemasonry, or marble-setting contractors; a local of the union listed above; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or apprenticeship agency.

For general information about the work of brickmasons, blockmasons, or stonemasons, contact:

- ▶ International Union of Bricklayers and Allied Craftworkers, 1776 I St. NW., Washington, DC. 20006. Internet: <http://www.bacweb.org>
- ▶ International Masonry Institute, Apprenticeship and Training, 837 Buena Vista Ave., Cascade, MD 21719. Internet: <http://www.imiweb.org>

Information about the work of bricklayers also can be obtained from:

- ▶ Associated General Contractors of America, Inc., 1957 E St. NW., Washington, DC 20006. Internet: <http://www.agc.org>
- ▶ Brick Industry Association, 11490 Commerce Park Dr., Reston, VA 22091-1525. Internet: <http://www.brickinfo.org>
- ▶ National Association of Home Builders, 1201 15th St. NW., Washington, DC 20005. Internet: <http://www.nahb.com>
- ▶ National Concrete Masonry Association, 2302 Horse Pen Rd., Herndon, VA 20171-3499. Internet: <http://www.ncma.org>

Carpenters

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Significant Points

- More than one-fourth of all carpenters—the largest construction trade in 2000—were self-employed.
- Job opportunities should be excellent, in part because of the large number of job openings created by carpenters who leave the occupation each year.
- Many builders use specialty carpentry subcontractors who do one or two work activities, so versatile carpenters able to switch specialties should have the best opportunities for steady work.

Nature of the Work

Carpenters are involved in many different kinds of construction activity. They cut, fit, and assemble wood and other materials for the construction of buildings, highways, bridges, docks, industrial plants, boats, ships, and many other structures. Carpenters also build doors or brattices (ventilation walls or partitions) in underground passageways to control the proper circulation of air through these passageways and to worksites. Carpenters' duties vary by type of employer. Builders increasingly are using specialty trade contractors who, in turn, hire carpenters who specialize in just one or two activities. Some of these activities are setting forms for concrete construction; erecting scaffolding; or doing finishing work, such as installing interior and exterior trim. However, a carpenter directly employed by a general building contractor often must perform a variety of the tasks associated with new construction, such as framing walls and partitions, putting in doors and windows, building stairs, laying hardwood floors, and hanging kitchen cabinets.

Because local building codes often dictate where certain materials can be used, carpenters must know these regulations. Each carpentry task is somewhat different, but most involve the same basic steps. Working from blueprints or instructions from supervisors, carpenters first do the layout—measuring, marking, and arranging materials. They cut and shape wood, plastic, fiberglass, or drywall, using hand and power tools, such as chisels, planes, saws, drills, and sanders. They then join the materials with nails, screws, staples, or adhesives. In the final step, carpenters check the accuracy of their work with levels, rules, plumb bobs, and framing squares, and make any necessary adjustments. When working with prefabricated components, such as stairs or wall panels, the carpenter's task is somewhat simpler than above, because it does not require as much layout work or the cutting and assembly of as many pieces. Prefabricated components are designed for easy and fast installation and generally can be installed in a single operation.

Carpenters who remodel homes and other structures must be able to do all aspects of a job—not just one task. Thus, individuals with good basic overall training are at a distinct advantage, because they can switch from residential building to commercial construction or remodeling work, depending on which offers the best work opportunities.

Carpenters employed outside the construction industry perform a variety of installation and maintenance work. They may replace panes of glass, ceiling tiles, and doors, as well as repair desks, cabinets, and other furniture. Depending on the employer, carpenters install partitions, doors, and windows; change locks; and repair broken furniture. In manufacturing firms, carpenters may assist in