

Median hourly earnings of tile- and marble setters were \$16.49 in 2000. The middle 50 percent earned between \$12.54 and \$21.93. The lowest 10 percent earned less than \$9.58, and the top 10 percent earned more than \$26.61. Earnings of tile- and marble setters also vary greatly by geographic location and by union membership.

Apprentices and other trainees usually start out earning about half of what an experienced worker earns, although their wage rate increases as they advance through the training program.

Some carpet, floor, and tile installers and finishers belong to the United Brotherhood of Carpenters and Joiners of America. Some tilesetters also belong to the International Union of Bricklayers and Allied Craftsmen, while some carpet installers belong to the International Brotherhood of Painters and Allied Trades.

Related Occupations

Carpet, floor, and tile installers and finishers measure, cut, and fit materials to cover a space. Workers in other occupations involving similar skills, but using different materials, include brickmasons, blockmasons, and stonemasons; carpenters; cement masons, concrete finishers, segmental pavers, and terrazzo workers; drywall installers, ceiling tile installers, and tapers; painters and paperhangers; roofers; and sheet metal workers.

Sources of Additional Information

For details about apprenticeships or work opportunities, contact local flooring or tilesetting contractors or retailers, locals of the unions previously mentioned, or the nearest office of the State apprenticeship agency or employment service.

For general information about the work of carpet installers and floor layers, contact:

► Floor Covering Installation Contractors Association, 7439 Milwood Dr., West Bloomfield, MI 48322.

Additional information on training for carpet installers and floor layers is available from:

► International Union of Painters and Allied Trades, 1750 New York Ave. NW., Washington, DC 20006. Internet: <http://www.iupat.org>

For general information about the work of tilesetters and finishers, contact:

► International Union of Bricklayers and Allied Craft Workers, International Masonry Institute, Apprenticeship and Training, 815 15th St. NW., Washington, DC 20005. Internet: <http://www.bacweb.org>

► National Association of Home Builders, 1201 15th St. NW., Washington, DC 20005. Internet: <http://www.nahb.com>

For information concerning training of carpet, floor, and tile installers and finishers contact:

► United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave. NW., Washington, DC 20001. Internet:

<http://necarpenters.org/ubc.htm>

Cement Masons, Concrete Finishers, Segmental Pavers, and Terrazzo Workers

(O*NET 47-2051.00, 47-2053.00, 47-4091.00)

Significant Points

- Job opportunities are expected to be excellent.
- Most learn on the job, either through formal 3-year apprenticeship programs or by working as helpers.
- Like many other construction trades workers, layoffs may occur during downturns in construction activity.

Nature of the Work

Cement masons, concrete finishers, and terrazzo workers all work with concrete, one of the most common and durable materials used in construction. Once set, concrete—a mixture of Portland cement, sand, gravel, and water—becomes the foundation for everything from decorative patios and floors to huge dams or miles of roadways.

Cement masons and *concrete finishers* place and finish the concrete. They also may color concrete surfaces; expose aggregate (small stones) in walls and sidewalks; or fabricate concrete beams, columns, and panels. In preparing a site for placing concrete, cement masons first set the forms for holding the concrete and properly align them. They then direct the casting of the concrete and supervise laborers who use shovels or special tools to spread it. Masons then guide a straightedge back and forth across the top of the forms to “screed,” or level, the freshly placed concrete. Immediately after leveling the concrete, masons carefully smooth the concrete surface with a “bull float,” a long-handled tool about 8 by 48 inches that covers the coarser materials in the concrete and brings a rich mixture of fine cement paste to the surface.

After the concrete has been leveled and floated, concrete finishers press an edger between the forms and the concrete and guide it along the edge and the surface. This produces slightly rounded edges and helps prevent chipping or cracking. They use a special tool called a “groover” to make joints or grooves at specific intervals that help control cracking. Next, finishers trowel the surface using either a powered or hand trowel, a small, smooth, rectangular metal tool.

Sometimes, cement masons perform all the steps of laying concrete, including the finishing. As the final step, masons retrowel the concrete surface back and forth with powered and hand trowels to create a smooth finish. For a coarse, nonskid finish, masons brush the surface with a broom or stiff-bristled brush. For a pebble finish, they embed small gravel chips into the surface. They then wash any excess cement from the exposed chips with a mild acid solution. For color, they use colored premixed concrete. On concrete surfaces that will remain exposed after the forms are stripped, such as columns, ceilings, and wall panels, cement masons cut away high spots and loose concrete with hammer and chisel, fill any large indentations with a Portland cement paste, and smooth the surface with a carborundum stone. Finally, they coat the exposed area with a rich Portland cement mixture, using either a special tool or a coarse cloth to rub the concrete to a uniform finish.

Throughout the entire process, cement masons must monitor how the wind, heat, or cold affects the curing of the concrete. They must have a thorough knowledge of concrete characteristics so that, by using sight and touch, they can determine what is happening to the concrete and take measures to prevent defects.

Segmental pavers lay out, cut, and install pavers, which are flat pieces of masonry usually made from compacted concrete or brick. Pavers are used to pave paths, patios, playgrounds, driveways, and steps. They are manufactured in various textures and often interlock together to form an attractive pattern. Segmental pavers first prepare the site by removing the existing pavement or existing soil. They grade the soil to the proper depth and determine the amount of base material that is needed, which depends on the local soil conditions. They then install and compact the base material, a granular material that compacts easily, and lay the pavers from the center out, so that any trimmed pieces will be on the outside rather than in the center. Then they install edging materials to prevent the pavers from shifting and fill the spaces between the pavers with dry sand.

Terrazzo workers create attractive walkways, floors, patios, and panels by exposing marble chips and other fine aggregates on the



Concrete finishers use hand trowels to smooth the surface.

surface of finished concrete. Much of the preliminary work of terrazzo workers is similar to that of cement masons. Attractive, marble-chip terrazzo requires three layers of materials. First, cement masons or terrazzo workers build a solid, level concrete foundation that is 3 to 4 inches deep. After the forms are removed from the foundation, workers add a 1-inch layer of sandy concrete. Before this layer sets, terrazzo workers partially embed metal divider strips in the concrete wherever there is to be a joint or change of color in the terrazzo. For the final layer, terrazzo workers blend and place into each of the panels a fine marble chip mixture that may be color-pigmented. While the mixture is still wet, workers toss additional marble chips of various colors into each panel and roll a light-weight roller over the entire surface.

When the terrazzo is thoroughly dry, helpers grind it with a terrazzo grinder, which is somewhat like a floor polisher, only much heavier. Slight depressions left by the grinding are filled with a matching grout material and hand-troweled for a smooth, uniform surface. Terrazzo workers then clean, polish, and seal the dry surface for a lustrous finish.

Working Conditions

Concrete, segmental paving, or terrazzo work is fast-paced and strenuous, and requires continuous physical effort. Because most finishing is done at floor level, workers must bend and kneel often. Many jobs are outdoors, and work is generally halted during inclement weather. The work, either indoors or outdoors, may be in areas that are muddy, dusty, and dirty. To avoid chemical burns from uncured concrete and sore knees from frequent kneeling, many workers wear kneepads. Workers also usually wear water-repellent boots while working in wet concrete.

Employment

Cement masons, concrete finishers, segmental pavers, and terrazzo workers held about 166,000 jobs in 2000; segmental pavers and terrazzo workers accounted for only a small portion of the total. Most cement masons and concrete finishers worked for concrete contractors or for general contractors on projects such as highways; bridges; shopping malls; or large buildings such as factories, schools, and hospitals. A small number were employed by firms that manufacture concrete products. Most segmental pavers and terrazzo workers worked for special trade contractors who install decorative floors and wall panels.

Only about 1 out of 20 cement masons, concrete finishers, segmental pavers, and terrazzo workers were self-employed, a smaller

proportion than in other building trades. Most self-employed masons specialized in small jobs, such as driveways, sidewalks, and patios.

Training, Other Qualifications, and Advancement

Most cement masons, concrete finishers, segmental pavers, and terrazzo workers learn their trades either through on-the-job training as helpers, or through 3-year apprenticeship programs. Many masons and finishers first gain experience as construction laborers. (See the statement on construction laborers elsewhere in the *Handbook*.)

When hiring helpers and apprentices, employers prefer high school graduates who are at least 18 years old and in good physical condition, and who have a driver's license. The ability to get along with others also is important because cement masons frequently work in teams. High school courses in general science, shop, mathematics, blueprint reading, or mechanical drawing provide a helpful background.

On-the-job training programs consist of informal instruction, in which experienced workers teach helpers to use the tools, equipment, machines, and materials of the trade. They begin with tasks such as edging, jointing and using a straightedge on freshly placed concrete. As training progresses, assignments become more complex, and trainees can usually do finishing work within a short time.

Three-year apprenticeship programs, usually jointly sponsored by local unions and contractors, provide on-the-job training in addition to a recommended minimum of 144 hours of classroom instruction each year. A written test and a physical exam may be required. In the classroom, apprentices learn applied mathematics, blueprint reading, and safety. Apprentices generally receive special instruction in layout work and cost estimation. Some workers learn their jobs by attending trade or vocational/technical schools.

Cement masons, concrete finishers, segmental pavers, and terrazzo workers should enjoy doing demanding work. They should take pride in craftsmanship and be able to work without close supervision.

Experienced cement masons, concrete finishers, segmental pavers, or terrazzo workers may advance to become supervisors or contract estimators. Some open their own concrete businesses.

Job Outlook

Despite expected slow job growth, opportunities for skilled cement masons, concrete finishers, segmental pavers, and terrazzo workers are expected to be excellent as the increase in demand outpaces the supply of workers trained in this craft. In addition, many potential workers may prefer work that is less strenuous and has more comfortable working conditions. Well-trained workers will have especially favorable opportunities.

Employment of cement masons, concrete finishers, segmental pavers, and terrazzo workers is expected to grow more slowly than the average for all occupations through 2010. These workers will be needed to build highways, bridges, subways, factories, office buildings, hotels, shopping centers, schools, hospitals, and other structures. In addition, the increasing use of concrete as a building material—particularly in nonresidential construction—will add to the demand. More cement masons also will be needed to repair and renovate existing highways, bridges, and other structures.

Employment growth, however, will not keep pace with the growth of these construction projects. Worker productivity will be increased through use of improved concrete pumping systems, continuous concrete mixers, quicker-setting cement, troweling machines, pre-fabricated masonry systems, and other improved materials, equipment, and tools. In addition to job growth, other openings will

become available as experienced workers transfer to other occupations or leave the labor force.

Employment of cement masons, concrete finishers, segmental pavers, and terrazzo workers, like that of many other workers, is sensitive to the fluctuations of the economy. Workers in these trades may experience periods of unemployment when the level of non-residential construction falls. On the other hand, shortages of these workers may occur in some areas during peak periods of building activity.

Earnings

In 2000, the median hourly earnings of cement masons and concrete finishers were \$13.50. The middle 50 percent earned between \$10.55 and \$18.41. The top 10 percent earned over \$24.22, and the bottom 10 percent earned less than \$8.31. Median hourly earnings in the industries employing the largest numbers of cement masons and concrete finishers in 2000 are shown below:

Masonry, stonework, and plastering	\$15.48
Highway and street construction	14.88
Concrete work	13.90
Nonresidential building construction	13.80
Residential building construction	11.31

In 2000, the median hourly earnings of terrazzo workers and finishers were \$15.06 and median annual earnings of segmental pavers were \$12.46.

Like those of other construction trades workers, earnings of cement masons, concrete finishers, segmental pavers, and terrazzo workers may be reduced on occasion because poor weather and downturns in construction activity limit the time they can work. Cement masons often work overtime, with premium pay, because once concrete has been placed, the job must be completed.

Many cement masons, concrete finishers, segmental pavers, and terrazzo workers belong to the Operative Plasterers' and Cement Masons' International Association of the United States and Canada, or to the International Union of Bricklayers and Allied Craftworkers. Some terrazzo workers belong to the United Brotherhood of Carpenters and Joiners of the United States. Nonunion workers generally have lower wage rates than union workers. Apprentices usually start at 50 to 60 percent of the rate paid to experienced workers.

Related Occupations

Cement masons, concrete finishers, segmental pavers, and terrazzo workers combine skill with knowledge of building materials to construct buildings, highways, and other structures. Other occupations involving similar skills and knowledge include brickmasons, blockmasons, and stonemasons; carpet, floor, and tile installers and finishers; drywall installers, ceiling tile installers, and tapers; and plasterers and stucco masons.

Sources of Additional Information

For information about apprenticeships and work opportunities, contact local concrete or terrazzo contractors, locals of unions previously mentioned, a local joint union-management apprenticeship committee, or the nearest office of the State employment service or apprenticeship agency.

For general information about cement masons, concrete finishers, segmental pavers, and terrazzo workers, contact:

- ▶ Associated General Contractors of America, Inc., 1957 E St. NW., Washington, DC 20006. Internet: <http://www.agc.org>
- ▶ International Union of Bricklayers and Allied Craftworkers, International Masonry Institute, 815 15th St. NW., Suite 1001, Washington, DC 20005. Internet: <http://www.bacweb.org>
- ▶ Operative Plasterers' and Cement Masons' International Association of the United States and Canada, 14405 Laurel Place, Suite 300, Laurel, MD 20707. Internet: <http://www.concrete-plaster.com>

- ▶ National Terrazzo and Mosaic Association, 101 E. Market St., Suite 200 A, Leesburg, VA 20176-3122. Internet: <http://www.ntma.com>
- ▶ Portland Cement Association, 5420 Old Orchard Rd., Skokie, IL 60077. Internet: <http://www.portcement.org/inde.asp>
- ▶ United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave. NW., Washington, DC 20001. Internet: <http://www.necarpenters.org/UBC.htm>

Construction and Building Inspectors

(O*NET 47-4011.00)

Significant Points

- About half of all inspectors worked for local governments, primarily municipal or county building departments.
- Opportunities should be best for experienced construction supervisors and craftworkers who have some college education, engineering or architectural training, or certification as construction inspectors or plan examiners.

Nature of the Work

Construction and building inspectors examine the construction, alteration, or repair of buildings, highways and streets, sewer and water systems, dams, bridges, and other structures to ensure compliance with building codes and ordinances, zoning regulations, and contract specifications. Building codes and standards are the primary means by which building construction is regulated in the United States to assure the health and safety of the general public. Inspectors make an initial inspection during the first phase of construction, and follow-up inspections throughout the construction project to monitor compliance with regulations. However, no inspection is ever exactly the same. In areas where certain types of severe weather or natural disasters are more common, inspectors monitor compliance with additional safety regulations designed to protect structures and occupants during these events.

Building inspectors inspect the structural quality and general safety of buildings. Some specialize in such areas as structural steel or reinforced concrete structures. Before construction begins, *plan examiners* determine whether the plans for the building or other structure comply with building code regulations and if they are suited to the engineering and environmental demands of the building site. Inspectors visit the worksite before the foundation is poured to inspect the soil condition and positioning and depth of the footings. Later, they return to the site to inspect the foundation after it has been completed. The size and type of structure, as well as the rate of completion, determine the number of other site visits they must make. Upon completion of the project, they make a final comprehensive inspection.

In addition to structural characteristics, a primary concern of building inspectors is fire safety. They inspect structures' fire sprinklers, alarms, and smoke control systems, as well as fire exits. Inspectors assess the type of construction, building contents, adequacy of fire protection equipment, and risks posed by adjoining buildings.

In the past, most localities based their building codes on regional model codes established by the Building Officials and Code Administration (BOCA), the International Conference of Building Officials (ICBO), or the Southern Building Code Congress International (SBCCI). Therefore, building inspectors in one region who were experts in one code found it difficult to move to an area of the