

eventually leave the occupation because they dislike the work or cannot find steady employment. Well-trained workers will have especially favorable opportunities.

Employment of carpenters is expected to increase more slowly than the average for all occupations. Construction activity should increase in response to demand for new housing and commercial and industrial plants and the need to renovate and modernize existing structures. The demand for larger homes with more amenities and for second homes will continue to rise, especially as the baby boomers reach their peak earning years and can afford to spend more on housing. At the same time, as the number of immigrants increase and as the echo boomers (the children of the baby boomers) replace the smaller baby bust generation in the young adult age groups, the demand for manufactured housing, starter homes, and rental apartments also is expected to increase.

However, some of the demand for carpenters will be offset by expected productivity gains resulting from the increasing use of prefabricated components, such as pre-hung doors and windows and prefabricated wall panels and stairs, which can be installed very quickly. Prefabricated walls, partitions, and stairs can be lifted into place in one operation; beams—and in some cases entire roof assemblies—can be lifted into place using a crane. As prefabricated components become more standardized, builders will use them more often. In addition, improved adhesives will reduce the time needed to join materials, and lightweight, cordless pneumatic and combustion tools—such as nailers and drills—all make carpenters more efficient.

Carpenters can experience periods of unemployment because of the short-term nature of many construction projects and the cyclical nature of the construction industry. Building activity depends on many factors—interest rates, availability of mortgage funds, the season, government spending, and business investment—that vary with the state of the economy. During economic downturns, the number of job openings for carpenters declines. New and improved tools, equipment, techniques, and materials have vastly increased carpenter versatility. Therefore, carpenters with all-round skills will have better opportunities than those who can do only a few relatively simple, routine tasks.

Job opportunities for carpenters also vary by geographic area. Construction activity parallels the movement of people and businesses and reflects differences in local economic conditions. Therefore, the number of job opportunities and apprenticeship opportunities in a given year may vary widely from area to area.

### Earnings

In 2000, median hourly earnings of carpenters were \$15.69. The middle 50 percent earned between \$11.99 and \$20.86. The lowest 10 percent earned less than \$9.48, and the highest 10 percent earned more than \$26.73. Median hourly earnings in the industries employing the largest numbers of carpenters in 2000 are shown below:

Masonry, stonework, and plastering .....	\$19.27
Nonresidential building construction .....	17.43
Heavy construction, except highway .....	16.74
Carpentry and floor work .....	15.51
Residential building construction .....	15.26

Earnings can be reduced on occasion, because carpenters lose worktime in bad weather and during recessions when jobs are unavailable.

Some carpenters are members of the United Brotherhood of Carpenters and Joiners of America.

### Related Occupations

Carpenters are skilled construction workers. Workers in other skilled construction occupations include brickmasons, blockmasons, and

stonemasons; cement masons, concrete finishers, segmental pavers, and terrazzo workers; electricians; pipelayers, plumbers, pipefitters, and steamfitters; and plasterers and stucco masons.

### Sources of Additional Information

For information about carpentry apprenticeships or other work opportunities in this trade, contact local carpentry contractors, locals of the union mentioned above, local joint union-contractor apprenticeship committees, or the nearest office of the State employment service or apprenticeship agency.

For information on training opportunities and carpentry in general, contact:

- Associated Builders and Contractors, 1300 N. 17th St., Suite 800, Arlington, VA 22209. Internet: <http://www.abc.org>
- Associated General Contractors of America, Inc., 1957 E St. NW., Washington, DC 20006. Internet: <http://www.agc.org>
- National Association of Home Builders, 1201 15th St. NW., Washington, DC 20005. Internet: <http://www.nahb.com>
- United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave. NW., Washington, DC 20001. Internet: <http://www.necarpenters.org/ubc.htm>

## Carpet, Floor, and Tile Installers and Finishers

(O\*NET 47-2041.00, 47-2042.00, 47-2043.00, 47-2044.00)

### Significant Points

- Almost half of all carpet, floor, and tile installers and finishers are self-employed, compared with fewer than 1 in 5 of all construction trades and related workers.
- Most workers learn on the job.
- Carpet installers, the largest specialty, should have the best job opportunities.
- Carpet, floor, and tile installers and finishers are less sensitive to fluctuations in construction activity than are other construction trades workers.

### Nature of the Work

Carpet, tile, and other types of floor coverings not only serve an important basic function in buildings, but their decorative qualities also contribute to the appeal of the buildings. Carpet, floor, and tile installers and finishers lay these floor coverings in homes, offices, hospitals, stores, restaurants, and many other types of buildings. Tile also is installed on walls and ceilings.

Before installing carpet, *carpet installers* first inspect the surface to be covered to determine its condition and, if necessary, correct any imperfections that could show through the carpet or cause the carpet to wear unevenly. They must measure the area to be carpeted and plan the layout, keeping in mind expected traffic patterns and placement of seams for best appearance and maximum wear.

When installing wall-to-wall carpet without tacks, installers first fasten a tackless strip to the floor, next to the wall. They then install the padded cushion or underlay. Next, they roll out, measure, mark, and cut the carpet, allowing for 2 to 3 inches of extra carpet for the final fitting. Using a device called a “knee kicker,” they position the carpet, stretching it to fit evenly on the floor and snugly against each wall and door threshold. They then rough cut the excess carpet. Finally, using a power stretcher, they stretch the carpet, hooking it to the tackless strip to hold it in place. The installer then finishes the edges using a wall trimmer.

Because most carpet comes in 12-foot widths, wall-to-wall installations require installers to tape or sew sections together for large rooms. They join the seams by sewing them with a large needle and special thread or by using heat-taped seams—a special plastic tape made to join seams when activated by heat.

On special upholstery work, such as stairs, carpet may be held in place with staples. Also, in commercial installations, carpet often is glued directly to the floor or to padding that has been glued to the floor.

Carpet installers use handtools such as hammers, drills, staple guns, carpet knives, and rubber mallets. They also may use carpet-laying tools, such as carpet shears, knee kickers, wall trimmers, loop pile cutters, heat irons, and power stretchers.

*Floor installers*, or *floor layers*, apply blocks, strips, or sheets of shock-absorbing, sound-deadening, or decorative coverings to floors and cabinets using rollers, knives, trowels, sanding machines, and other tools. Some floor covering materials are designed to be purely decorative. Others have more-specialized purposes, such as to deaden sound, to absorb shocks, or to create air-tight environments. Before installing the floor, floor layers inspect the surface to be covered and, if necessary, correct any imperfections in order to start with a smooth, clean foundation. They measure and cut floor covering materials, such as rubber, vinyl, linoleum, or cork, and any foundation material, such as felt, according to designated blueprints. Next, they may nail or staple a wood underlayment to the surface or may use an adhesive to cement the foundation material to the floor; the foundation helps to deaden sound and prevents the top floor covering from wearing at board joints. Finally, floor layers install the top covering. They join sections of sheet covering by overlapping adjoining edges and cutting through both layers with a knife to form a tight joint.

*Floor sanders and finishers* scrape and sand wooden floors to smooth surfaces using floor-scrappers and floor-sanding machines. They then inspect the floor for smoothness and remove excess glue from joints using knife or scraper or wood chisel and may sand wood surfaces by hand, using sandpaper. Finally, they apply coats of finish.

*Tile installers*, *tilesetters*, and *marble setters* apply hard tile and marble to floors, walls, ceilings and roof decks. Tile is durable, impervious to water, and easy to clean, making it a popular building material in hospitals, tunnels, lobbies of buildings, bathrooms, and kitchens. To set tile, which generally ranges in size from 1 inch to 12 or more inches square, tilesetters use cement or “mastic,” a very sticky paste. When using cement, tilesetters nail a support of metal mesh to the wall or ceiling to be tiled. They use a trowel to apply a cement mortar—called a “scratch coat”—onto the metal screen, and scratch the surface of the soft mortar with a small tool, similar to a rake. After the scratch coat has dried, tilesetters apply another coat of mortar to level the surface, and then apply mortar to the back of the tile and place it onto the surface.

To set tile in mastic or a cement adhesive, called “thin set,” tilesetters need a flat, solid surface such as drywall, concrete, plaster, or wood. They use a tooth-edged trowel to spread mastic on the surface or apply cement adhesive, and then properly position the tile.

Because tile varies in color, shape, and size, workers sometimes prearrange tiles on a dry floor according to a specified design. This allows workers to examine the pattern and make changes. In order to cover all exposed areas, including corners, and around pipes, tubs, and wash basins, tilesetters cut tiles to fit with a machine saw or a special cutting tool. Once the tile is placed, they gently tap the surface with their trowel handle or a small block of wood to seat the tiles evenly.

When the cement or mastic has set, tilesetters fill the joints with “grout,” which is very fine cement. They then scrape the surface with a rubber-edged device called a grout float or a grouting trowel



*Almost half of all carpet, floor, and tile installers and finishers are self-employed.*

to dress the joints and remove excess grout. Before the grout sets, they finish the joints with a damp sponge for a uniform appearance. *Tile finishers* help some tilesetters by supplying and mixing construction materials and doing other tasks such as applying grout and cleaning installed tile.

Marble setters cut and set marble slabs in floors and walls of buildings. They trim and cut marble to specified size using a power wet saw, other cutting equipment, or handtools. After setting the marble in place, they polish the marble to high luster using power tools or by hand.

### **Working Conditions**

Carpet, floor, and tile installers and finishers generally work indoors and have regular daytime hours. However, when floor covering installers work in occupied stores or offices, they may work evenings and weekends to avoid disturbing customers or employees. Installers and finishers usually work under better conditions than most other construction workers. By the time workers install carpets, flooring, or tile in a new structure, most construction has been completed and the work area is relatively clean and uncluttered. Installing these materials is labor intensive; workers spend much of their time bending, kneeling, and reaching—activities that require endurance. Carpet installers frequently lift heavy rolls of carpet and may move heavy furniture. Safety regulations may require that they wear kneepads or safety goggles when using certain tools. Carpet and floor layers may be exposed to fumes from various kinds of glue and to fibers of certain types of carpet.

Although workers are subject to cuts from tools or materials, falls from ladders, and strained muscles, the occupation is not as hazardous as some other construction occupations.

### Employment

Carpet, floor, and tile installers and finishers held about 167,000 jobs in 2000. Almost half of all carpet, floor, and tile installers and finishers were self-employed, compared with fewer than 1 in 5 of all construction trades workers. The following tabulation shows 2000 employment by specialty.

Carpet installers .....	76,000
Tile and marble setters .....	54,000
Floor layers, except carpet, wood, and hard tiles .....	23,000
Floor sanders and finishers .....	14,000

Many carpet installers worked for flooring contractors or floor covering retailers. Most salaried tilesetters were employed by tilesetting contractors who work mainly on nonresidential construction projects, such as schools, hospitals, and office buildings. Most self-employed tilesetters work on residential projects.

Although carpet, floor, and tile installers and finishers are employed throughout the Nation, they tend to be concentrated in populated areas where there are high levels of construction activity.

### Training, Other Qualifications, and Advancement

The vast majority of carpet, floor, and tile installers and finishers learn their trade informally, on the job, as helpers to experienced workers. Others learn through formal apprenticeship programs, which include on-the-job training as well as related classroom instruction.

Informal training for carpet installers often is sponsored by individual contractors, and generally lasts from about 1-1/2 to 2 years. Workers start as helpers, and begin with simple assignments, such as installing stripping and padding, or helping to stretch newly installed carpet. With experience, helpers take on more difficult assignments, such as measuring, cutting, and fitting.

Persons who wish to begin a career in carpet installation as a helper or apprentice should be at least 18 years old and have good manual dexterity. Many employers prefer applicants with a high school diploma; courses in general mathematics and shop are helpful. Some employers may require a driver's license and a criminal background check. Because carpet installers frequently deal directly with customers, they should be courteous and tactful.

Many tile and floor layers learn their job through on-the-job training and begin by learning about the tools of the trade. They next learn to prepare surfaces to receive flooring. As they progress, tilesetters, marble setters, and resilient floor layers learn to cut and install tile, marble, and floor coverings. Tile and marble setters also learn to apply grout and to do finishing work.

Apprenticeship programs and some contractor-sponsored programs provide comprehensive training in all phases of the tilesetting and floor layer trade. Most apprenticeship programs are union-sponsored and consist of weekly classes and on-the-job training usually lasting 3 to 4 years.

When hiring apprentices or helpers for floor layer and tilesetter jobs, employers usually prefer high school graduates who have had courses in general mathematics, mechanical drawing, and shop. Good physical condition, manual dexterity, and a good sense of color harmony also are important assets.

Carpet, floor, and tile installers and finishers may advance to positions as supervisors or become salespersons or estimators. Some carpet installers may become managers for large installation firms. Many carpet, floor, and tile installers and finishers who

begin working for a large contractor eventually go into business for themselves as independent subcontractors.

### Job Outlook

Employment of carpet, floor, and tile installers and finishers is expected to grow about as fast as the average for all occupations through the year 2010. Employment growth stems primarily from the continued need to renovate and refurbish existing structures. Carpet installers, the largest specialty, should have the best job opportunities.

Carpet as a floor covering continues to be popular and its use is expected to grow in structures such as schools, offices, hospitals, and industrial plants. Demand for carpet also will be stimulated by new, more durable fibers that are stain and crush resistant, and come in a wider variety of colors. More resilient carpet needs to be replaced less often, but these attractive new products may induce more people to replace their old carpeting, contributing further to the demand for carpet installers. Employment also is expected to grow because wall-to-wall carpeting is a necessity in the many houses built with plywood, rather than hardwood floors. Similarly, offices, hotels, and stores often cover concrete floors with wall-to-wall carpet, which must be periodically replaced.

Demand for tile and marble setters will stem from population and business growth, which should result in more construction of shopping malls, hospitals, schools, restaurants, and other structures in which tile is used extensively. Tile is expected to continue to increase in popularity as a building material and to be used more extensively, particularly in more expensive homes, whose construction is expected to increase. In more modestly priced homes, however, the use of tile substitutes, such as plastic or fiberglass tub and shower enclosures, is expected to increase, slowing the growth in demand for tile and marble setters. Demand for floor layers and sanders and finishers will increase as a result of an increase in construction activity, particularly of residential homes and commercial buildings, and as some people decide to replace their plywood floors with hardwood floors. Job opportunities for tile and marble setters and floor layers and sanders, relatively small specialties, will not be as plentiful as those for carpet installers.

Carpet, floor, and tile installers and finishers are less sensitive to changes in construction activity than are most other construction occupations because much of their work involves replacing carpet and other flooring in existing buildings. As a result these workers tend to be sheltered from the business fluctuations that often occur in new construction activity.

### Earnings

In 2000, the median hourly earnings of carpet installers were \$14.46. The middle 50 percent earned between \$10.41 and \$20.47. The lowest 10 percent earned less than \$7.97, and the top 10 percent earned more than \$26.22. Median hourly earnings of carpet installers in 2000 in carpentry and floor work were \$15.25 and in furniture and home furnishings stores, \$13.31.

Carpet installers are paid either on an hourly basis, or by the number of yards of carpet installed. The rates vary widely depending on the geographic location and whether the installer is affiliated with a union.

Median hourly earnings of floor layers were \$14.81 in 2000. The middle 50 percent earned between \$10.53 and \$20.21. The lowest 10 percent earned less than \$8.06, and the top 10 percent earned more than \$26.01.

Median hourly earnings of floor sanders and finishers were \$13.17 in 2000. The middle 50 percent earned between \$10.51 and \$17.80. The lowest 10 percent earned less than \$8.75, and the top 10 percent earned more than \$24.72.

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