

They often practice cutting on discarded glass. After a while, they are given an opportunity to cut glass for a job. Eventually, helpers assist experienced workers on simple installation jobs. By working with experienced glaziers, they eventually acquire the skills of a fully qualified glazier.

Employers recommend that glaziers learn the trade through a formal apprenticeship program that lasts 3 to 4 years. Apprenticeship programs, which are administered by the National Glass Association and local union-management committees or local contractors' associations, consist of on-the-job training, as well as 144 hours of classroom instruction or home study each year. On the job, apprentices learn to use the tools and equipment of the trade; handle, measure, cut, and install glass and metal framing; cut and fit moldings; and install and balance glass doors. In the classroom, they are taught basic mathematics, blueprint reading and sketching, general construction techniques, safety practices, and first aid. Learning the trade through an apprenticeship program usually takes less time and provides more complete training than acquiring skills informally on the job, but opportunities for apprenticeships are declining.

Local apprenticeship administrators determine the physical, age, and educational requirements needed by applicants for apprenticeships and for helper positions. In general, applicants must be in good physical condition and be at least 17 years old. High school or vocational school graduates are preferred. In some areas, applicants must take mechanical-aptitude tests. Courses in general mathematics, blueprint reading or mechanical drawing, general construction, and shop provide a good background.

Standards for acceptance into apprenticeship programs are rising to reflect changing requirements associated with new products and equipment. In addition, the growing use of computers in glass layout requires that glaziers be familiar with personal computers.

Because many glaziers do not learn the trade through a formal apprenticeship program, the National Glass Association (NGA) offers a series of written examinations that certify an individual's competency to perform glazier work at three progressively more difficult levels of proficiency. These levels include Level I, Glazier; Level II, Commercial Interior/Residential Glazier or Storefront/Curtainwall Glazier; and Level III, Master Glazier. Recently, the NGA has added a new certification program for auto-glass repair.

Advancement generally consists of increases in pay for most glaziers; some advance to supervisory jobs or become contractors or estimators.

Job Outlook

Job opportunities are expected to be excellent for glaziers, largely due to the numerous openings arising each year as experienced glaziers leave the occupation. 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 glaziers is expected to increase about as fast as the average for all occupations through the year 2010, as a result of growth in residential and nonresidential construction. Demand for glaziers will be spurred by the continuing need to modernize and repair existing structures and the popularity of glass in bathroom and kitchen design. Improved glass performance in the areas of insulation, privacy, safety, condensation control, and noise reduction also are expected to contribute to the demand for glaziers in both residential and nonresidential remodeling. A continuing emphasis on energy management, which encourages people to replace their old windows and doors with high-efficiency products, also will spur the demand for glaziers.

Similar to other construction-trades workers, construction glaziers should expect to experience periods of unemployment resulting from

the limited duration of construction projects and the cyclical nature of the construction industry. During bad economic times, job openings for glaziers are reduced as the level of construction declines. Because construction activity varies from area to area, job openings, as well as apprenticeship opportunities, fluctuate with local economic conditions. Employment and apprenticeship opportunities should be greatest in metropolitan areas, where most glazing contractors and glass shops are located.

Earnings

In 2000, median hourly earnings of glaziers were \$14.32. The middle 50 percent earned between \$10.88 and \$19.35. The lowest 10 percent earned less than \$8.50, and the highest 10 percent earned more than \$25.78. Median hourly earnings in the industries employing the largest numbers of glaziers in 2000 are shown below:

| | |
|-----------------------------------------------|---------|
| Miscellaneous special trade contractors | \$15.39 |
| Paint, glass, and wallpaper stores | 12.60 |

Glaziers covered by union contracts generally earn more than their nonunion counterparts. Apprentice wage rates usually start at 50 to 60 percent of the rate paid to experienced glaziers and increase every 6 months. Because glaziers can lose time due to weather conditions and fluctuations in construction activity, their overall earnings may be lower than their hourly wages suggest.

Many glaziers employed in construction are members of the International Brotherhood of Painters and Allied Trades.

Related Occupations

Glaziers use their knowledge of construction materials and techniques to install glass. Other construction workers whose jobs also involve skilled, custom work are brickmasons, blockmasons, and stonemasons; carpenters; carpet, floor, and tile installers and finishers; cement masons, concrete finishers, segmental pavers, and terrazzo workers; and painters and paperhangers.

Sources of Additional Information

For more information about glazier apprenticeships or work opportunities, contact local glazing or general contractors, a local of the International Brotherhood of Painters and Allied Trades, a local joint union-management apprenticeship agency, or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of glaziers, contact:

► International Brotherhood of Painters and Allied Trades, 1750 New York Ave. NW., Washington, DC 20006.

For information concerning training for glaziers, contact:

► National Glass Association, Education and Training Department, 8200 Greensboro Dr., Suite 302, McLean, VA 22102-3881. Internet: <http://www.glass.org>

Hazardous Materials Removal Workers

(O*NET 47-4041.00)

Significant Points

- Working conditions can be difficult, and the use of protective clothing is often required.
- Formal education beyond high school is not required, but a training program leading to a Federal license is mandatory.
- Excellent job opportunities are expected.

Nature of the Work

Increased public awareness and Federal and State regulations are resulting in the removal of hazardous materials from buildings, facilities, and the environment to prevent further contamination of natural resources and to promote public health and safety. Hazardous-materials removal workers identify, remove, package, transport, and dispose of various hazardous materials, including asbestos, lead, and radioactive and nuclear materials. The removal of hazardous materials, or “hazmats,” from public places and the environment also is called abatement, remediation, and decontamination.

Hazardous-materials removal workers use a variety of tools and equipment, depending on the work at hand. Equipment ranges from brooms to personal protective suits that completely isolate workers from the hazardous material. Depending on the threat of contamination, equipment required can include disposable or reusable coveralls, gloves, hard hats, shoe covers, safety glasses or goggles, chemical-resistant clothing, face shields, and hearing protection. Most workers also are required to wear respirators while working to protect them from airborne particles. These respirators range from simple versions that cover only the mouth and nose to self-contained suits with their own air supply.

Asbestos is a material used in the past for fireproofing roofing and flooring, for heat insulation, and for a variety of other uses. While materials containing asbestos rarely are used in buildings anymore, there still are structures containing the material. When embedded in materials, asbestos is fairly harmless; when airborne, however, asbestos can cause several lung diseases, including lung cancer and asbestosis.

Lead was a common building component found in paint and plumbing fixtures and pipes until the late 1970’s. Because lead is easily absorbed into the bloodstream, it can travel to vital organs and build up there. The health risks associated with lead poisoning include fatigue, loss of appetite, miscarriage, and learning disabilities and decreased IQ in children. Due to these risks, it has become necessary to remove lead-based products and asbestos from buildings and structures.

Asbestos-abatement and *lead-abatement workers* remove these and other materials from buildings scheduled to be renovated or demolished. They use a variety of hand and power tools, such as vacuums and scrapers, to remove asbestos and lead from surfaces. The vacuums used by asbestos-abatement workers have special, highly efficient filters designed to trap the asbestos, which is later disposed of or stored. During the abatement, special monitors for asbestos and lead content sample the air to protect the workers; lead-abatement workers also wear a personal air monitor that indicates how much lead the worker has been exposed to. Workers also use monitoring devices to identify the asbestos, lead, and other materials that need to be removed from the surfaces of walls and structures.

A typical residential lead-abatement project involves using a chemical to strip the lead-based paint from the walls of the home. Lead-abatement workers apply the compound with a putty knife and allow it to dry. Then, they scrape the hazardous material into an impregnable container for transport and storage. They also use sandblasters and high-pressure water sprayers to remove lead from large structures.

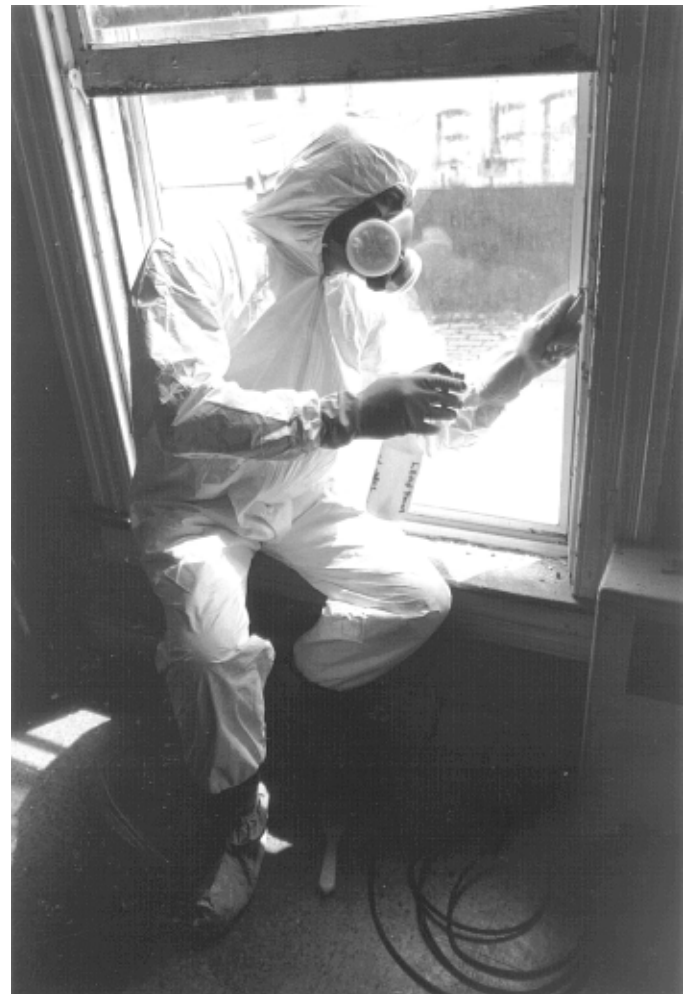
Radioactive materials are classified as either high- or low-level wastes. High-level wastes primarily are nuclear-reactor fuels used to produce electricity. Low-level wastes include any radioactively contaminated protective clothing, tools, filters, medical equipment, and other items. *Decontamination technicians* perform duties similar to janitors and cleaners. They use brooms, mops, and other tools to clean exposed areas and remove exposed items for decontamination or disposal. With experience, these workers can advance to

radiation-protection technician jobs and use radiation survey meters to locate and evaluate materials, operate high-pressure cleaning equipment for decontamination, and package radioactive materials for transportation or disposal.

Decommissioning and decontamination (D&D) workers remove and treat radioactive materials generated by nuclear facilities and power plants. They use a variety of handtools to break down contaminated items such as “gloveboxes,” which are used to process radioactive materials. At decommissioning sites, the workers clean and decontaminate the facility, as well as remove any radioactive or contaminated materials.

Treatment, storage, and disposal (TSD) workers transport and prepare materials for treatment or disposal. To ensure proper treatment of materials, laws require workers in this field to be able to verify shipping manifests. At incinerator facilities, these workers transport materials from the customer or service center to the incinerator. At landfills, they follow a strict procedure for the processing and storage of hazardous materials. They organize and track the location of items in the fill and may help change the state of a material from liquid to solid in preparation for its storage. These workers typically operate heavy machinery such as forklifts, earthmoving machinery, and large trucks and rigs.

Hazardous-materials removal workers also may be required to construct scaffolding or erect containment areas prior to the abatement or decontamination. Government regulation, in most cases, dictates that hazardous-materials removal workers are closely supervised on the worksite. The standard usually is 1 supervisor to every



Hazardous materials removal workers use chemicals to remove lead-based paint.

10 workers. The work is very structured, planned out sometimes years in advance, and team-oriented. There is a great deal of cooperation among supervisors and coworkers. Due to the nature of the materials being removed, work areas are restricted to licensed hazardous-materials removal workers, thus minimizing exposure to the public.

Working Conditions

Hazardous-materials removal workers face different working conditions depending on their area of expertise. Although many work a standard 40-hour week, overtime and shiftwork is not uncommon, especially in asbestos and lead abatement. Asbestos- and lead-abatement workers tend to work primarily in buildings and other structures, such as office buildings and schools. Because they are under pressure to complete their work within certain deadlines, workers may experience fatigue. Completing projects frequently requires night and weekend work, because hazardous-materials removal workers often work around the schedules of others. Treatment, storage, and disposal workers are employed primarily at facilities such as landfills, incinerators, boilers, and industrial furnaces. These facilities often are located in remote areas due to the kinds of work being done. As a result, workers employed by treatment, storage, or disposal facilities may commute long distances to work.

Decommissioning and decontamination workers, decontamination technicians, and radiation protection technicians work at nuclear facilities and electrical power plants. These sites, like treatment, storage, and disposal facilities, often are far from urban areas. Workers, who often perform jobs in cramped conditions, may need to use sharp tools to dismantle contaminated objects. A hazardous-materials removal worker must have great self-control and a level head to cope with the daily stress associated with working with hazardous materials.

Hazardous-materials removal employees work in a highly structured environment to minimize danger. Each phase of an operation is planned in advance, and workers are trained to deal with safety breaches and hazardous situations. Crews and supervisors take every precaution to ensure that the worksite is safe. Hazardous-materials removal workers, whether working in asbestos and lead abatement or in radioactive decontamination, must stand, stoop, and kneel for long periods. Some hazardous-materials removal workers must wear fully enclosed personal protective suits for several hours at a time; these suits may be hot and uncomfortable and cause some individuals to experience claustrophobia.

Hazardous-materials removal workers may be required to travel outside their normal working area in order to respond to emergency situations. These emergency cleanups sometimes take several days or weeks to complete, and workers usually are away from home for the duration of the project.

Employment

Hazardous-materials removal workers held about 37,000 jobs in 2000. Nearly half were employed by special trade contractors, primarily in asbestos and lead abatement. Almost a quarter worked in water supply and sanitary services. A small number worked in electric services at nuclear and electric plants as decommissioning and decontamination workers and radiation safety and decontamination technicians.

Training, Other Qualifications, and Advancement

Formal education beyond a high school diploma is not required to become a hazardous materials removal worker. However, workers must be able to perform basic mathematical conversions and calculations, manipulating readings for consideration during the

abatement. To perform the job duties, workers also should have good physical strength and manual dexterity.

Because of the nature of the work to be done and the time constraints sometimes involved, employers prefer people who are dependable, prompt, and detail-oriented. Because much of the work is done in buildings, a background in construction is helpful.

Federal regulations require a license to work as a hazardous-materials removal worker. Most employers provide technical training on the job, but a formal 32- to 40-hour training program must be completed to be licensed to work as an asbestos- and lead-abatement worker or a treatment, storage, and disposal worker. The program covers health hazards, personal protective equipment and clothing, site safety, hazard recognition and identification, and decontamination. In some cases, workers will discover one hazardous material while abating another. If the workers are not licensed to work with the newly discovered material, they cannot continue to work. Many experienced workers opt to take courses in additional disciplines to avoid this situation. Some employers prefer to hire workers licensed in multiple disciplines.

For decommissioning and decontamination workers employed at nuclear facilities, training is more extensive. In addition to the standard 40-hour training course in asbestos, lead, and hazardous waste, workers must take courses on regulations governing nuclear materials and radiation safety. These courses add up to approximately 3 months of training, although most are not taken consecutively. Many agencies, organizations, and companies throughout the country provide training programs that are approved by the U.S. Environmental Protection Agency, the U.S. Department of Energy, and other regulatory bodies. Workers in all fields are required to take refresher courses every year to maintain their license.

Job Outlook

Job opportunities are expected to be excellent for hazardous-materials removal workers, largely due to the numerous openings arising each year as experienced workers leave the occupation. 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.

The overall employment in this occupation is expected to grow faster than average for all occupations through the year 2010. Employment of the largest group of workers, asbestos- and lead-abatement workers, is expected to grow as fast as other occupations in special trade contractors, but opportunities will be best in lead abatement. Compared with other construction trades occupations, employment of lead-abatement workers is much less affected by slowdowns in the economy.

Employment of decontamination technicians, radiation safety technicians, and decommissioning and decontamination workers is expected to grow in response to increased pressure for safer and cleaner nuclear and electric generator facilities. In addition, the number of closed facilities that need decommissioning may continue to grow due to Federal legislation. These workers also are less affected by fluctuations in the economy because the facilities they work in must operate regardless of the state of the economy.

Opportunities will be best in the private sector as more State and local governments contract out hazardous-materials removal work to private companies.

Earnings

Median hourly earnings of hazardous materials removal workers were \$13.71 in 2000. The middle 50 percent earned between \$11.34 and \$18.56 per hour. The lowest 10 percent earned less than \$9.33 per hour, and the highest 10 percent earned more than \$24.01 per hour.

The median hourly earnings in the largest industries employing hazardous materials removal workers in 2000 are shown below.

| | |
|-----------------------------------------------|---------|
| Miscellaneous special trade contractors | \$13.78 |
| Sanitary services | 13.30 |

According to the limited data available, treatment, storage, and disposal workers usually earn slightly more than asbestos- and lead-abatement workers or decontamination technicians. Decontamination and decommissioning workers and radiation protection technicians, though constituting the smallest group, tend to earn the highest wages.

Related Occupations

Asbestos- and lead-abatement workers share skills with other construction trades workers, including brickmasons, blockmasons, and stonemasons; cement masons, concrete finishers, segmental pavers, and terrazzo workers; insulation workers; and sheet-metal workers. Treatment, storage, and disposal workers, decommissioning and decontamination workers, and decontamination and radiation safety technicians work closely with plant and system operators, such as power plant operators, distributors, and dispatchers and water and wastewater treatment plant operators.

Sources of Additional Information

For more information on hazardous-materials removal workers, including training information, contact:

► Laborers-AGC Education and Training Fund, 37 Deerfield Rd., P.O. Box 37, Promfret, CT 06259.

Insulation Workers

(O*NET 47-2131.00, 47-2132.00)

Significant Points

- Workers must follow strict safety guidelines to protect themselves from the dangers of insulating irritants.
- Most insulation workers learn informally on the job; others complete formal apprenticeship programs.
- Excellent employment opportunities are expected, resulting largely from job turnover.

Nature of the Work

Properly insulated buildings reduce energy consumption by keeping heat in during the winter and out in the summer. Refrigerated storage rooms, vats, tanks, vessels, boilers, and steam and hot water pipes also are insulated to prevent the wasteful transfer of heat. Insulation workers install the materials used to insulate buildings and equipment.

Insulation workers cement, staple, wire, tape, or spray insulation. When covering a steam pipe, for example, insulation workers measure and cut sections of insulation to the proper length, stretch it open along a cut that runs the length of the material, and slip it over the pipe. They fasten the insulation with adhesive, staples, tape, or wire bands. Sometimes, they wrap a cover of aluminum, plastic, or canvas over it and cement or band the cover in place. Insulation workers may screw on sheet metal around insulated pipes to protect the insulation from weather conditions or physical abuse.

When covering a wall or other flat surface, workers may use a hose to spray foam insulation onto a wire mesh. The wire mesh provides a rough surface to which the foam can cling and add strength to the finished surface. Workers may then install drywall or apply a final coat of plaster for a finished appearance.



Insulation workers install insulation around pipes and within walls and floors.

In attics or exterior walls of uninsulated buildings, workers blow in loose-fill insulation. A helper feeds a machine with fiberglass, cellulose, or rock wool insulation while another worker blows the insulation with a compressor hose into the space being filled.

In new construction or major renovations, insulation workers staple fiberglass or rockwool batts to exterior walls and ceilings before drywall, paneling, or plaster walls are put in place. In making major renovations to old buildings or when putting new insulation around pipes and industrial machinery, insulation workers often must first remove the old insulation. In the past, asbestos—now known to cause cancer in humans—was used extensively in walls and ceilings and for covering pipes, boilers, and various industrial equipment. Because of this danger, U.S. Environmental Protection Agency regulations require that asbestos be removed before a building undergoes major renovations or is demolished. When asbestos is present, specially trained workers must remove the asbestos before insulation workers can install the new insulating materials. (See the statement on hazardous-materials removal workers elsewhere in the *Handbook*.)

Insulation workers use common handtools—trowels, brushes, knives, scissors, saws, pliers, and stapling guns. They use power saws to cut insulating materials, welding machines to join sheet metal or secure clamps, and compressors to blow or spray insulation.

Working Conditions

Insulation workers generally work indoors. They spend most of the workday on their feet, either standing, bending, or kneeling. Sometimes, they work from ladders or in tight spaces. The work requires more coordination than strength. Insulation work often is dusty and dirty, and the summer heat can make the insulation worker very uncomfortable. Minute particles from insulation materials, especially when blown, can irritate the eyes, skin, and respiratory system. Workers must follow strict safety guidelines to protect themselves from the dangers of insulating irritants. They keep work areas well-ventilated; wear protective suits, masks, and respirators; and take decontamination showers when necessary.

Employment

Insulation workers held about 53,000 jobs in 2000. The construction industry employed 9 out of 10 of these workers; most worked for insulation or other construction trades contractors. Small numbers of insulation workers held jobs in the Federal Government, in wholesale trade, and in shipbuilding and other manufacturing