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Excerpt from

Introduction to the Building Trades

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Preview

The following is a sample excerpt from a study unit converted into the Adobe Acrobat format. A sample online exam is available for this excerpt.

When people talk about major modern industries, the construction industry is often overlooked. Automobile manufacturing, steel production, communications, and computer technology are the industries that are most often mentioned when people think of the giants. However, all of the buildings that those products are manufactured in, and all of the homes that shelter the employees of those industries, were built by the construction industry.

Because the construction industry is so important, skilled professionals are needed to work in this field. While construction companies are responsible for the completion of projects, individual craftspeople will perform the actual work. Builders and contractors employ different skilled workers to complete each phase of a construction project. These workers are highly trained individuals who possess the skills, tools, and knowledge to work a job through from beginning to end, making sure that the work complies with all building codes and other laws. In some cases, certain workers in the building trades will even be licensed to perform a particular type of work. It takes a lot of training to learn the skills you need to do the job properly and efficiently, and also to reach your own personal career goals.

The study unit on which this excerpt is based introduces you to the construction industry as a whole and to the different trades that are a part of the industry.

After reading through the following material, feel free to take the sample exam based on this excerpt.

Contents

Introduction to the Building Trades

INTRODUCTION TO THE CONSTRUCTION INDUSTRY

Residential and Commercial Construction

The construction industry is a major part of our country's economy. At the present time in the United States, the annual value of new construction is approximately $600 billion, with residential construction accounting for over $180 billion. More than 5 million people work in the building trades, including superintendents, estimators, project managers, architects, and engineers. However, the largest segment of the construction industry is made up of the many professional building trades workers who perform all of the actual hands-on work.

The construction industry is generally divided into two parts—residential construction and commercial construction. *Residential construction* covers the construction of homes and residential buildings, such as garages, sheds, and other outbuildings. *Commercial construction* covers all commercial and industrial buildings, including office buildings, factories, power plants, parking garages, restaurants, and shopping malls.

For the most part, construction companies tend to specialize in only one segment of the construction industry; that is, either residential or commercial. There are some exceptions, of course. However, in the end, the size and type of the construction project doesn't make a lot of difference. Whether a construction company is building one house, a development of 25 houses, or a large sports stadium, the company will hire a number of subcontractors who specialize in particular building trades to complete the actual work. Although each subcontractor will specialize in one building trade, all will be required to complete their work on time, within the allowed budget for the job, and with a high degree of quality and accuracy.

Subcontractors are smaller companies that employ technicians who are skilled in one particular building trade. Roofing contractors, bricklaying contractors, and electrical contractors are all commonly employed to perform specialized tasks on a construction project. Each subcontractor will have the personnel, tools, equipment, and expertise to produce the expected results. In residential construction, subcontractors are often small companies that employ three or four people. Larger residential subcontractors, however, may be organizations made up of hundreds of skilled technicians. Commercial subcontractors are often large organizations that employ skilled technicians as well as project managers, estimators, office workers, and others who support the organization.

Construction may be one of the few remaining industries that provides every person involved in it a real opportunity for success. It's not uncommon for the head of a large construction company or subcontracting company to be a person who started his or her career in the building trades. With hard work, training, and personal ambition, many people are able to rise very rapidly in construction. While a college degree may be helpful, it's not necessary to accomplish your career goals. However, a full understanding of how things are accomplished in construction is absolutely essential. The "career tree" shown in Figure 1 shows the many paths that are open to you as you progress through the building trades.

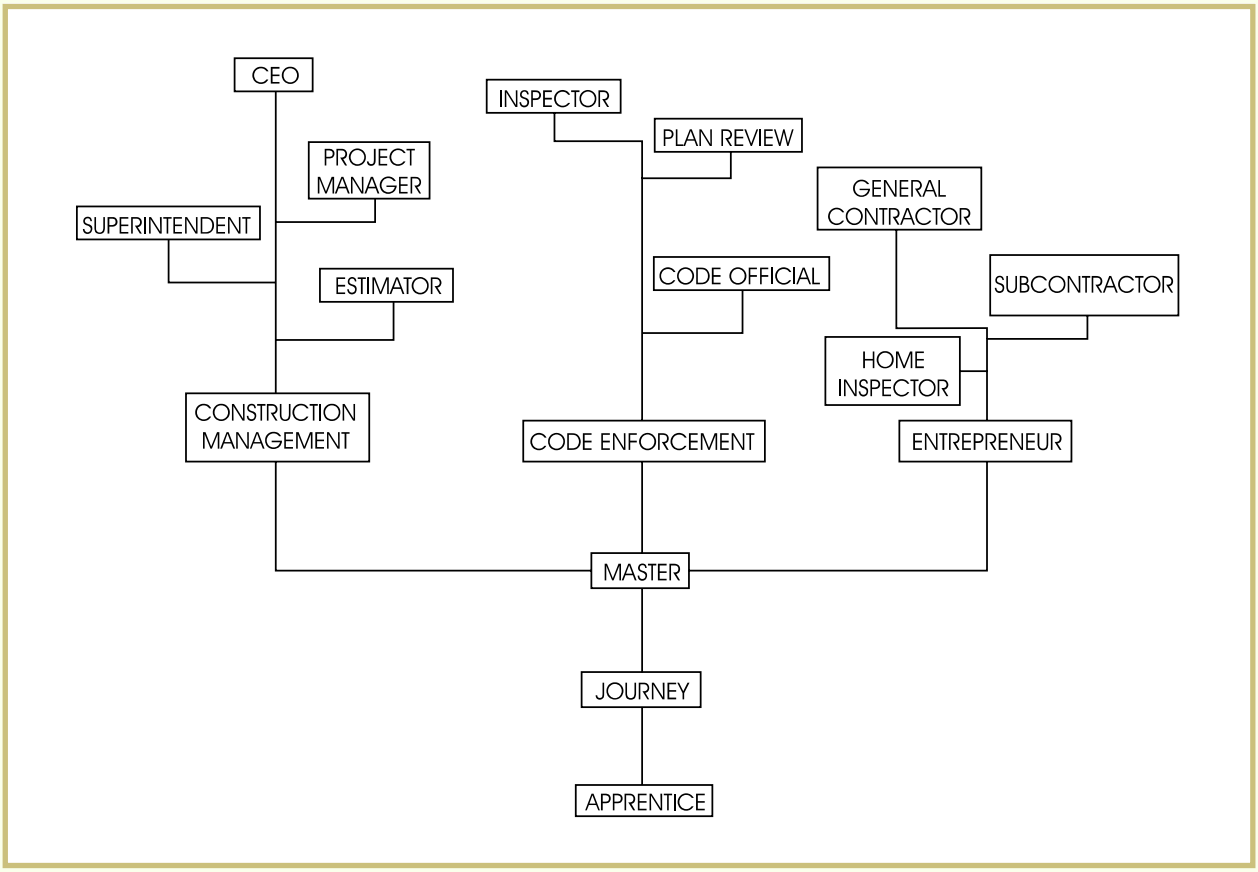


FIGURE 1—This career tree shows the many paths that are open to you in the world of construction.

Trade Unions and Associations

Construction industry trade unions and professional associations are a good source of information on construction regulations (local, state, and federal), supplemental educational programs, starting a business, obtaining licensing, new technology, and even social activities. These organizations exist to represent the common interests of both individuals and companies. Most are national groups that will have a local affiliate in your local area, but some are strictly local groups.

Professional associations may be able to recommend employment opportunities as well as training programs that can help you to advance in your trade. Many groups sponsor apprenticeship programs that will

combine on-the-job experience with formal classroom training. Typically, apprenticeship programs are between three and five years in length, with the average program running for four years. An apprenticeship can provide you with an opportunity to earn a living wage while you're learning, and the cost of the education is often covered by your employer. For information on apprenticeship programs or on any other construction topic, contact the national offices of the associations and unions you might be interested in, and ask for the nearest local affiliate.

Professional Licensing

In many areas, building trades workers will need *licenses* to perform certain types of work. Licenses are issued in order to ensure the quality of the work that's done, and also to ensure individual compliance with the building codes and regulations that protect consumers. The building trades that most often require licenses are electrical work and plumbing. In a growing number of areas, however, heating, ventilating, and air conditioning (HVAC) technicians will also need to obtain licenses.

The licensing process promotes professionalism in the building trades and ensures that technicians have the proper technical knowledge to do the job correctly. For example, if a house was wired by an unskilled and uncertified worker, an improper installation could lead to a fire or an electrical shock. A poorly installed plumbing fixture that doesn't comply with code regulations could lead to expensive water damage to the home, or even pollution of the environment. An incorrectly installed HVAC system could leak refrigerant gases into the air and cause dangerous pollution. All of these situations can be prevented by making sure that only skilled professionals do these types of work. A skilled professional is someone who has demonstrated knowledge of the rules and regulations of a trade and obtained a license. The licensing procedure is the best way to ensure that workers in those fields have the skills and knowledge they need, so you should plan to earn licenses whenever necessary.

The licensing process is generally the same regardless of the trade or geographic area. There are three different levels of ability as defined by the license—apprentice, journey, and master. Let's take a closer look at the requirements for each licensing level.

The *apprentice* level is the beginning trade level and has the fewest requirements. The apprentice may need to enroll in a registered apprenticeship program (that is, a program that's approved by his or her state) for the duration of the apprenticeship period, which is usually four years. Apprentices must often work under the direct supervision of a licensed technician in order for their work experience to count toward the program's requirements. An apprenticeship program ensures that you'll have the opportunity to develop the skills necessary for advancement to the next level.

The next trade level is the *journey* level. To move up to this level, you must possess a certain number of work experience hours. You must also pass a written test to demonstrate your practical knowledge and familiarity with the codes that regulate the trade. If you have the required number of work experience hours and receive a passing grade on the

written test, you'll be entitled to a journey license. At this level, you can work unsupervised and on your own. It's very important to strive to reach the journey level in the licensed trades. Without a journey license, you're limited in what you can do, employers are limited in the kind of work they can give you, and the wage you can earn is limited.

The highest license you can earn is the *master* license. To receive a master license, you'll require between two and four years of experience at the journey level with an employer who has a master license. You'll also need to pass another written test that's designed to determine your understanding of the codes and regulations that govern your trade area. A master license allows you to supervise other workers, and it's often required to obtain a permit to do work in that trade. Every company needs at least one person who possesses a master license in order to carry on their work. The owner of a company will often have a master license, but it's not uncommon for the owner to hire others who also possess their master licenses. At the master level, you'll be paid the highest wage rates in the trade.

To find out the licensing requirements for particular trades in your local area, contact your state licensing office. They should be able to give you the information you need to obtain appropriate licenses. You could also ask an experienced worker for guidance in this area.

In the construction industry, building codes are updated, new building materials are introduced, and new work techniques are developed frequently. The best way to keep up with all these changes is to continue the learning and training process throughout your life. Your career goal may be to obtain a higher license, be promoted to a supervisory job, or run your own construction company. However, no matter what your goal is, it will be much easier to reach that goal if you keep up to date with the advances in your trade (and in the construction industry as a whole). Remember, people who enter a building trade and make no effort to learn new skills will never advance beyond the beginner level.

PLUMBING

Plumbers often joke that all they need to know is "hot on the left and cold on the right." However, in reality, plumbing systems are quite complex and must be installed according to many technical rules in order to ensure that the system will function properly for many years to come.

In residential construction, the plumbing installations will usually be made after the HVAC installations are complete. The professional plumber's job is to install a system that will carry water into a house, provide a method to heat some of the water, carry the hot and cold water to the appliances and fixtures where it's needed, and remove all of the waste water from the house (Figure 2). The plumbing system must be tightly enclosed and connected carefully to prevent water from leaking out and causing damage to the home's interior. The plumber is also responsible for the connection of gas or fuel oil lines that are connected to appliances and HVAC units.

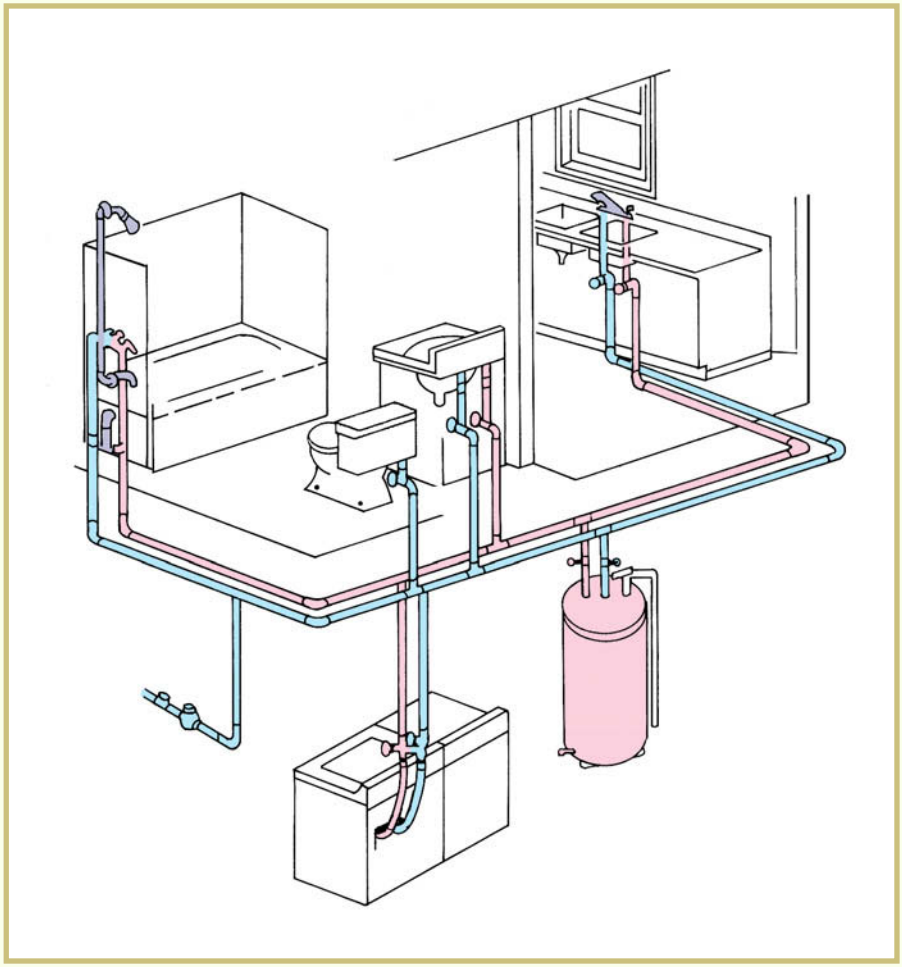


FIGURE 2—This illustration shows a typical residential water distribution system. Water is supplied from a well on the property, or from a municipal service. The water enters the house, is heated as needed, and is distributed to appliances and fixtures. The waste water is then removed for disposal to a septic system or a municipal sewage treatment plant.

The first thing the plumber will do at a building site is to connect the water supply for the house. The water supply may be either a municipal water supply (usually located at the street) or a well on the property. Before the foundation is in place, the pipe is placed where it will come into the house and is capped off. Then, later, after the framing and HVAC have been completed, the plumbers will return to do the rough-in. *Rough-in* is the major phase of the plumber's work when all of the water and waste lines are installed through the floors and walls. The ends of the pipes will then be capped at the locations where they project out from the walls and floors. Later, when the interior walls are covered, the pipes will be uncapped and the plumbing fixtures will be connected to them.

The plumber's work is guided by the construction plans and the applicable building codes. The plans will show the location of each of the appliances and fixtures that require a connection, and the building code provides the rules that apply to all areas of the job. The building code will do all of the following:

- Identify the type of pipe that may be used for an installation
- Specify the diameter of the pipe that must be used for supply lines throughout the installation so that water pressure from the source can be maintained

- Specify the diameter of the waste lines that must be used to prevent them from becoming obstructed
- Specify the allowable slope (angle) of horizontal waste lines so that solid and liquid waste move through the line together (If the slope is too great, solid wastes will be left behind to clog the line.)
- Provide the maximum distance a sink, toilet, or other drain line can be from a vent stack. (All waste lines must be vented up through the roof to allow sewer gas to escape and to prevent vacuums from forming in the line, as shown in Figure 3.)

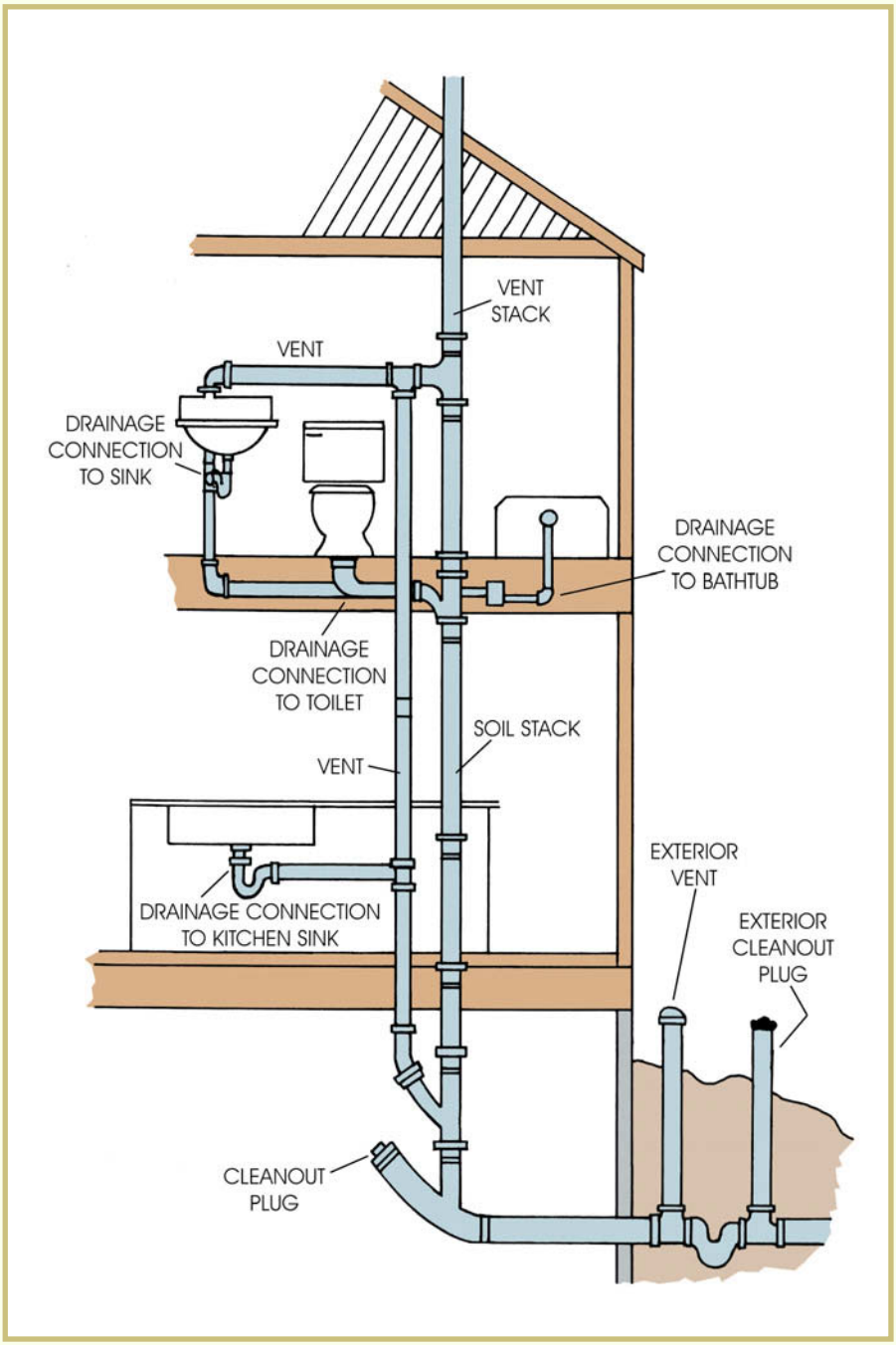
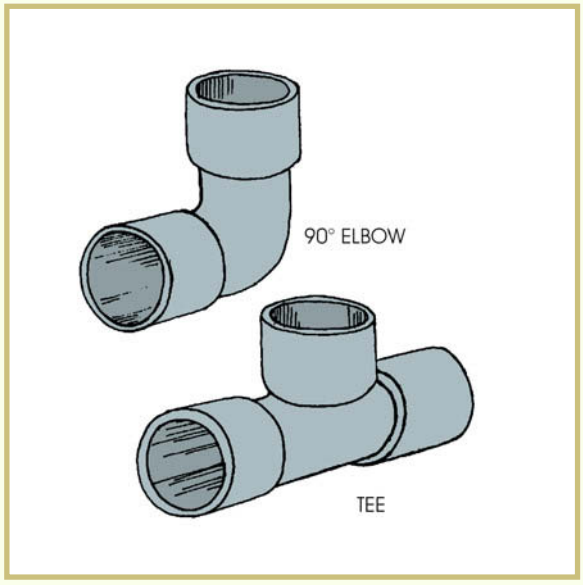


FIGURE 3—This illustration of a typical home drainage system shows how the vent stack leads out through the roof. All waste lines must be vented up through the roof to allow sewer gas to escape, and to prevent vacuums from forming in the line.

While construction plans and the building code provide general guidelines for plumbing installations, professional plumbers will also need to rely on their own skills to lay out a plumbing installation to fit the piping in a particular structure. The plumber's goal will be to install the piping system within the confines of the structure, with the least amount of waste material possible. In order to make a piping system fit a particular structure, plumbers will need to measure and mark the areas where pipes will be installed and connected; check for obstructions (such as heat ducts); and, if necessary, find a way to install the pipe around an obstruction. Sometimes, plumbers will need to cut holes through the wood frame to install pipe.

Plumbers use three basic types of materials when constructing plumbing systems: plastic, copper, and steel. Water supply lines are usually made of copper or plastic, and waste lines are usually made of plastic or steel. To assemble a system, plumbers cut and bend lengths of pipe, and then connect the pipe lengths with *fittings* (Figure 4). The method of connection depends on the type of pipe used. Plastic pipe sections and fittings are connected with adhesives. The fittings for copper pipe sections are slid over the ends of the pipes and soldered in place with a torch. The plumber will cut screw-type threads in the ends of steel pipe sections so that they can be screwed together with couplings.

FIGURE 4—The 90° elbow and the tee shown here are two very common pipe fittings.



Some plumbers specialize in repair work. This could include any type of repairs, such as fixing leaky faucets, replacing water heaters, and replacing underground water or waste lines. Because plumbers will have direct contact with customers when doing repair work, they need to have good communication and customer service skills.

Although there's no uniform national licensing requirement, most states and local areas require plumbers to be licensed. There are usually two types of licenses that are available—a journey license and a master license. To earn each type of license, you'll need to have a certain number of years of work experience and to pass a written test. Plumbers will also usually need a separate license to run pipes and make connections for natural gas services. Check with local building officials to learn about the requirements in your area.

The following are some skills that you should develop in order to become a professional plumber:

- Reading construction plans and interpreting the information accurately
- Measuring accurately with several different tools
- Applying basic math skills
- Cutting different types of pipe accurately
- Using a variety of hand tools and power tools, including pipe cutters, pipe threaders, and pipe benders
- Using gas and acetylene touches to do soldering and brazing
- Working with different types of plumbing fixtures like bathtubs, shower stalls, sinks, and toilets
- Working as part of a team
- Working quickly and efficiently to save time and materials

Plumbers must also be knowledgeable about the following:

- Local building code regulations
- The materials that are used in building projects

Contact the following organizations for general information about the plumbing profession.

- Associated Builders and Contractors
  http://www.abc.org/
- American Fire Sprinkler Association
  http://www.firesprinkler.org/
- Home Builders Institute (National Association of Home Builders)
  http://www.hbi.org/
- Mechanical Contractors Association of America
  http://www.mcaa.org/
- National Fire Sprinkler Association
  http://www.nfsa.org/
- Plumbing-Heating-Cooling Contractors—National Association
  http://www.phccweb.org/
- United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada
  http://www.ua.org/

The Appendix at the end of this excerpt contains the mailing addresses for these and other professional organizations in the building trades.

Appendix

Contact the following organizations and associations for information about specific building trades.

Air Conditioning Contractors of America
1712 New Hampshire Avenue NW
Washington, DC 20009

Air Conditioning and Refrigeration Institute
4201 North Fairfax Drive, Suite 425
Arlington, VA 22203

American Fire Sprinkler Association
9696 Skillman Street, Suite 300
Dallas, Texas 75243-8264

Associated Builders and Contractors
1300 North 17th Street, Suite 800
Rosslyn, VA 22209

Associated General Contractors of America, Inc.
1957 E Street NW
Washington, DC 20006

Brick Institute of America
11490 Commerce Park Drive, Suite 300
Reston, VA 22091-1525

Home Builders Institute
National Association of Home Builders
1201 15th Street NW, Sixth Floor
Washington, DC 20005

Independent Electrical Contractors, Inc.
507 Wythe Street
Alexandria, VA 22314

International Brotherhood of Electrical Workers
1125 15th Street NW
Washington, DC 20005

International Brotherhood of Painters and Allied Trades
1750 New York Avenue NW
Washington, DC 20006

International Union of Bricklayers and Allied Craftsmen
815 15th Street NW
Washington, DC 20005

Mechanical Contractors Association of America
1385 Piccard Drive
Rockville, MD 20850-4329

National Association of the Remodeling Industry
4900 Seminary Road, Suite 320
Alexandria, VA 22311

National Concrete Masonry Association
2302 Horse Pen Road
Herndon, VA 22071

National Electrical Contractors Association
3 Metro Center, Suite 1100
Bethesda, MD 20814

National Fire Sprinkler Association
PO Box 1000
Patterson, NY 12563

National Property Management Association, Inc.
380 Main Street, Suite 290
Dunedin, FL 34698

National Roofing Contractors Association
O'Hare International Center
10255 West Higgins Road, Suite 600
Rosemont, IL 60018-5607

Plumbing-Heating-Cooling Contractors—National Association
180 S. Washington Street
P.O. Box 6808
Falls Church, VA 22040

Refrigeration Service Engineers Society
1666 Rand Road
Des Plaines, IL 60016-3552

United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada
901 Massachusetts Avenue NW
Washington, DC 20001

United Brotherhood of Carpenters and Joiners of America
101 Constitution Avenue NW
Washington, DC 20001

United Union of Roofers, Waterproofers and Allied Workers
1125 17th Street NW
Washington, DC 20036

You can explore the earning potential and employment opportunities for plumbers by reading through the entry for the plumbing trade in the current *Occupational Outlook Handbook*. This book is revised every two years by the U.S. Department of Labor's Bureau of Labor Statistics. A current copy can be found in most libraries.

If you have a computer and access to the Internet (also available in many libraries), you can read the *Occupational Outlook Handbook* online at http://stats.bls.gov/oco/home.htm. Here are the direct links to the handbook entries for several of the most common building trades:

- Carpentry
  http://stats.bls.gov/oco/ocos202.htm
- Bricklaying and Stonemasonry
  http://stats.bls.gov/oco/ocos201.htm
- Drywall Installation
  http://stats.bls.gov/oco/ocos205.htm
- Electrical Work
  http://stats.bls.gov/oco/ocos206.htm
- General Maintenance
  http://stats.bls.gov/oco/ocos191.htm
- Heating and Air-Conditioning Installation
  http://stats.bls.gov/oco/ocos192.htm
- Plumbing
  http://stats.bls.gov/oco/ocos211.htm
- Roofing
  http://stats.bls.gov/oco/ocos212.htm