



BUILDING TRADES II

PLUMBING: ROUGH-IN AND FINAL



**TEACHER'S
GUIDE**



INTRODUCTION

This Teacher's Guide provides information to help you get the most out of *Plumbing: Rough-In and Final*. The contents in this guide will allow you to prepare your students before using the program and present follow-up activities to reinforce the program's key learning points.

This program provides an overview of how to complete the installation process for plumbing a house. The video focuses on both the rough-in and finish plumbing work that must be completed in order to complete the construction of a home. During the program, students will learn about the types of pipes used in plumbing, how to install plumbing, and the basic principles behind how plumbing works in a home.

LEARNING OBJECTIVES

After viewing the program, students will be able to:

- Identify the three types of plumbing systems used in residential homes and explain the differences between each system.
- Describe the process for installing the rough plumbing in a home.
- Describe the precautions that contractor's should take when roughing-in plumbing pipes.
- Describe the process for installing bathtubs and showers in a residential home.
- Describe the different types of plumbing fixtures used in residential homes.

EDUCATIONAL STANDARDS

National Standards

This program correlates with the National Competency Standards and Objectives from the National Standards for Construction Education and Research. The content has been aligned with the following educational standards and benchmarks from this organization.

- Identify the common types of fittings and valves used with plastic piping.
- Identify and determine the kinds of hangers and supports needed for plastic piping.
- Demonstrate the ability to properly measure, cut, and join plastic piping.
- Identify the techniques used in hanging and supporting copper piping.
- Demonstrate the ability to properly measure, ream, cut, and join copper piping.
- Explain how waste moves from a fixture through the drain system to the environment.
- Identify the major components of a drainage system and describe their functions.
- Identify the various types of DWV fittings and describe their applications.

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English Language Arts Standards

The activities in this Teacher's Guide were created in compliance with the following National Standards for the English Language Arts from the National Council of Teachers of English.



- Use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).
- Adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- Employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
- Use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
- Conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries.

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Technology Standards

The activities in this Teacher's Guide were created in compliance with the following National Education Technology Standards from the National Education Technology Standards Project.

- Develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
- Use a variety of media and formats to communicate information and ideas effectively to multiple audiences.
- Employ technology in the development of strategies for solving problems in the real world.
- Use technology resources for solving problems and making informed decisions.
- Use technology tools to enhance learning, increase productivity, and promote creativity.
- Use technology tools to process data and report results.
- Use technology to locate, evaluate, and collect information from a variety of sources.

The National Education Technology Standards reprinted with permission from the International Society for Technology Education.

PROGRAM OVERVIEW

This program looks at plumbing in its two construction phases: rough-in, or initial installation, and final. Details of water systems and drainage, waste, and venting (DWV) systems are examined, as well as tools commonly used.

MAIN TOPICS

Topic 1: Introduction

This section discusses the importance of proper planning when plumbing a house, and describes the three plumbing systems typically installed in residential building projects.



Topic 2: Stages of Plumbing and Types of Pipes

This segment discusses the different stages of plumbing (rough-in and finish) and the different types of pipes used in the process.

Topic 3: Rough-Ins for Plumbing

This section focuses on the rough steps to be followed when installing plumbing in a home. The segment also provides detailed information on the steps to be performed and recommendations for roughing-in the plumbing without damaging the integrity of the framing.

Topic 4: Installing Fixtures

This segment focuses on aspects of installing plumbing fixtures such as bathtubs, showers, toilets, sinks, and dishwashers. It also provides detailed information on how to install these fixtures properly.

Topic 5: Conclusion

This section briefly reviews the key topics discussed in the video.

FAST FACTS

- By the time you've finished installing the plumbing in your project, the house will have some 300 feet of concealed piping under the floor and in the partitions.
- The most widely used plumbing codes are found in the Uniform Plumbing Code. Any of the standards set by these codes can be, and sometimes are, outweighed by local codes, which can be different and more stringent.
- Because the waste and vent systems are tied closely together in function and connect together at various places in the piping, they are often referred to as the drain-waste-vent system, or the DWV system.
- Residential plumbing is performed in two stages. The first is the rough-in, which is essentially the plumbing work that runs the delivery and distribution lines, the waste lines, and vent system throughout the house. Final, or "finish" plumbing, is installing the fixtures and fittings.
- The most common types of pipes used today in residential construction are copper and plastic piping.
- The measurement for a length of pipe should include the socket depth—the distance the pipe will screw into a fitting.
- There are five types of supply fittings: elbows, tees, caps, couplings, and unions.
- Supply fittings can have sharp angles and the water will still move through them, because the water running through supply lines is under pressure.
- DWV fittings must have more gradual bends because the water has no pressure other than gravity pushing it along.
- Because a supply line running into the house is operating under pressure, no slope is necessary for its run from the water supply to the house.
- When installing the plumbing pipes, avoid cutting into the framing whenever possible.



VOCABULARY TERMS

closet bend: Connection between the toilet floor flange and the soil stack.

drain-waste system: Carries used water and waste away from the house to a sewer system.

fittings: Devices used to join pipes to each other and to the fixtures.

P-trap: A trap with a vertical inlet and a horizontal outlet.

pipe size: Diameter of the plumbing pipe.

shut-off valves: Valves that open and close off the flow of water.

soil stack: Large vertical pipe that carries waste from the branch lines to the sewer system.

supply system: Provides fresh water from a municipal water line or a well to the house through a single pipe.

trap: Curved section of drain pipe that keeps sewer gasses from backing up into the house.

vent system: Provides air to the drain system so that the drain water flows freely.

PRE-PROGRAM DISCUSSION QUESTIONS

1. What are the different types of plumbing systems installed in homes?
2. What materials are most commonly used in plumbing pipes today?
3. What is the difference between drain waste vents and supply lines?
4. What are the most commonly used plumbing codes? Should they supercede local building codes?
5. What is the purpose of a soil stack?

POST-PROGRAM DISCUSSION QUESTIONS

1. Describe the plumbing supply system for a residential home.
2. Describe the drain-waste system for a residential home.
3. Describe the vent system for a residential home.
4. What are the five different supply fittings, and when are they used?
5. What are the five different DWV fittings, and when are they used?

GROUP ACTIVITIES

Review Blueprints

Provide groups with a set of blueprints and have them identify key aspects of the plumbing portion of the job. For example, ask them to identify all of the modifications that might need to be made to the framing to accommodate the rough plumbing. Once groups have finished that task, have them switch blueprints with another group and check the accuracy of the work the first group did.

Plumbing Tools

Assign small groups to identify the key tools needed in plumbing a house, and then create a diagram that shows a building in the framing stages and identify which tools should be used for the different parts of the plumbing project.



Materials Report

Groups research the different types of materials available for use in the plumbing and write a brief report on the advantages of each option and the relative cost of the different options. Groups should be prepared to present their findings to the class.

INDIVIDUAL STUDENT PROJECTS

Inspections

Have students visit several construction sites (with permission from the builder) to determine how well the principles discussed in this video are followed on various job sites. For example, students might describe what type of pipes the contractor used in construction and speculate as to why those were chosen. Students should write a brief summary of their findings.

Framing for Plumbing Pipes

Students describe the modifications or changes to the framing of a house that need to be made to accommodate the plumbing pipes. Encourage students to use a set of framing blueprints to highlight the areas where plumbing pipes might be installed and how they might require notching of the framing.

Building Codes

Students research the building codes required in their area for plumbing and identify the codes they would need to follow to build a home in that area.

INTERNET ACTIVITIES

Safety Precautions when Plumbing

Students research the safety precautions they should take when plumbing a home. List should include equipment and tips plumbers can use to make their workplace safer.

Installing Plumbing Fixtures

Students research the techniques and useful tips to follow when installing the finish plumbing fixtures. Then, they write a brief report that describes the techniques and create a “job-aid” for tips that crews can follow when finishing plumbing.

Installing Rough Plumbing

Students research the techniques and useful tips to follow when installing the rough plumbing for a home. Then, they write a brief report that describes the techniques, and create a “job-aid” for tips that crews can follow when roughing-in the plumbing mechanicals.

ASSESSMENT QUESTIONS

Q: Before you begin plumbing a home, you should study the _____.

A: blueprints

Feedback: Review the plans to make sure they are complete and accurate before you begin installation work. The plans—and your work—must adhere to several types of strict codes.



Q: The most widely used plumbing codes are found in the _____.

A: Uniform Plumbing Code

Feedback: Any of the standards set by these codes can be, and sometimes are, outweighed by local codes which can be different and more stringent. Always check your local codes.

Q: In its simplest form, plumbing a house entails installing three systems. List each system.

A: Supply system, drain-waste system, and the vent system.

Feedback: The supply system provides fresh water from a municipal water line or a well to the house through a single pipe. The drain-waste system carries used water and wastes away from the house to a sewer system. The vent system provides air to the drain system so that the drain water flows freely.

Q: The diameter of flexible copper is determined by:

- (a) measuring the diameter inside the pipe
- (b) measuring the diameter outside the pipe
- (c) both of the above

A: (b)

Feedback: The diameter of flexible copper is determined by the outside measurement. The purpose of the pipe will often determine what type and diameter of pipe you need to use.

Q: Tee supply fittings are used to:

- (a) change directions
- (b) divert water to another line
- (c) join sections of pipe
- (d) tie threaded pipes together

A: (b)

Feedback: There are five types of supply fittings: elbow, to change directions; tees, to divert water to another line; caps, to end a pipe run; couplings, to join sections of pipe; and unions, to tie threaded pipes together.

Q: Why can supply fittings have sharp angles?

A: Supply fittings can have sharp angles and the water will still move through them because the water running through supply lines is under pressure.

Feedback: DWV fittings must have more gradual bends because the water has no pressure other than that provided by gravity.

Q: What should be included when measuring the length of a pipe?

A: The measurement for a length of pipe should include the socket depth—the distance the pipe will screw into a fitting.

Feedback: Fittings are the devices used to join pipes to each other and to the fixtures.

Q: _____ are the devices used to join pipes to each other and to the fixtures.

A: Fittings

Feedback: Fittings are identified as either supply fittings or DWV fittings.



- Q:** Larger, heavier pipes—like those for the drainage system—should have support every:
- (a) 1-2 feet
 - (b) 2-4 feet
 - (c) 4-6 feet
 - (d) 6-8 feet

A: (c)

Feedback: If the pipes are plastic keep the supports loose, because plastic will expand when it warms up.

Q: What should you remember when running plumbing lines under the basement slab or through concrete?

A: First, don't put joints below the slab or within the concrete. Second, wherever copper passes through concrete, place a sleeve over the pipe.

Feedback: Sleeving the copper allows room for flexibility and provides a cushion against the pressure that can be caused by thermal expansion and contraction.

ADDITIONAL RESOURCES

WEB SITES

How Your House Works

www.hometips.com/hyhw/book/housetop.html

The Plumber.com

www.theplumber.com

Plumbing Magazine On-Line

www.pmmag.com

PLBG.com

www.plbg.com

BOOKS

Plumbing a House (For Pros by Pros Series) by Peter Hemp. Taunton Press, 2001. ISBN: 1561583332

Plumbing: Basic, Intermediate & Advanced Projects by Merle Henkenius. Creative Homeowner Press, 2002. ISBN: 1580110851

The Complete Guide to Home Plumbing by Black & Decker. Creative Publishing International, 2001. ISBN: 0865734283

OTHER PRODUCTS

Residential Plumbing, VHS/DVD, Meridian Education

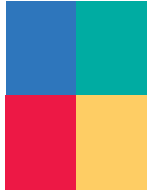
This program illustrates what it takes to design the plumbing service, and how to install pipes, faucets, drains, sinks, bathtubs, and showers. The host demonstrates how to rough in the pipes, cut holes in the floor, sweat copper pipes, and bond PVC pipes. An extremely instructive how-to video.

Order #: 26211, www.meridianeducation.com, 1-800-727-5507

Careers in Construction Trades, CD-ROM, Shopware

This interactive CD-ROM guides users through several occupations in the construction industry, including cement masons, bricklayers, plumbers, pipe fitters, carpenters, and electricians. Video interview segments include information on the background of each job, what is expected of the employee, qualifications, subjects in which to enroll, what the job is like, expected wages, and outlook for each job. Interactions and quiz segments appear throughout the program to help reinforce concepts and information.

Order #: 20434, www.shopware-usa.com, 1-800-487-3392





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