



## WEATHERIZATION

### TOPIC OF STUDY

Plumbing



90 MINUTES

### KEY TERMS

**Brazing:** the process used to join two pieces of metal pipe using a filler metal for adhesion

**Gasket:** a seal which fills the space between two or more mating surfaces to prevent leakage

**Teflon tape:** thin tape used for installing shower heads

**Pipe slope:** for pipes that carry liquid or combustion gases, there are proper slope requirements depending on what is carried.

## LESSON

Basic Plumbing Applications

## OBJECTIVES

Students will:

- Identify plumbing components
- Seal plumbing penetrations
- Install low-flow showerheads
- Install pipe wrap
- Identify common plumbing hazards

## BIG IDEA(S)

It is important for a retrofit installer to understand some of the methods that plumbers use to identify hazards and repair needs.

## TASK LIST SUBCATEGORY

- 102 Describe how energy is fundamental to our everyday lives
- 303 Demonstrate the use of PPE
- 305 Recognize and mitigate hazards
- 311 Recognize, identify and safely use hand tools and power tools
- 803 Identify and evaluate mechanical, electrical, plumbing and roofing systems
- 810 Use industry vocabulary
- 811 Prepare and maintain tools and equipment used for energy auditing and weatherization

## OVERVIEW

Installers are restricted from providing measures that require a licensed plumber and therefore act mostly as a plumbers' assistants, applying measures such as low-flow fixtures, sealing building penetrations, installing pipe wrap, and repairing thermal boundary. With that in mind, it is important for a retrofit installer to understand some of the methods that plumbers use to identify hazards and repair needs.

## STANDARDS

### PA/SDP

**3.4.10.B2.** Demonstrate how humans devise technologies to reduce the negative consequences of other technologies.

**3.4.12.E3.** Compare and contrast energy and power **systems** as they relate to pollution, renewable and non-renewable resources, and conservation

**4.2.10.B.** Evaluate factors affecting availability of natural resources: Analyze technologies that affect the use of our natural resources.

### Maintenance/Operations Career Pathway (AC-MO)

(5) Plan and practice preventative maintenance activities to service existing buildings.

(6) Maintain and inspect building systems to achieve safe and efficient operation of buildings.

**Career Cluster 15: STEM.** Demonstrate technical skills needed in a chosen STEM field.



## INSTRUCTIONAL

### TEXT/REFERENCES

*Energy Conservation Handbook*. pp. 161-163

### MATERIALS NEEDED

**Technology:** Computer with YouTube access



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## IMPLEMENTATION (LESSON PLAN)

1. Review safety and work site hazards (*Energy Conservation Handbook*, p. 162)
2. Evaluate worksite areas and hazards.
3. Sealing Penetrations



Through a masonry wall



Bathroom pipe penetrations



Floors and ceilings



Around raceways and chases that are usually closed with a bump-out

## IMPLEMENTATION (LESSON PLAN) - CONTINUED

### 4. Installing pipe wrap

Insulating hot water pipes reduces heat loss and can raise water temperature 2°F–4°F hotter than uninsulated pipes can deliver, allowing you to lower your water temperature setting. You also won't have to wait as long for hot water when you turn on a faucet or showerhead, which helps conserve water.



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### 5. Installing low-flow shower heads

<https://blog.constellation.com/2016/07/05/average-shower-length-flowchart/>

What is a low-flow shower head? It's a shower head that is designed to reduce the amount of water that is wasted in order for your home to be more water-efficient.

Shower heads can't control whether you're taking a long, luxurious shower of course, but they can help reduce your water heating costs. In fact, water heating is the second-largest energy expense for the average home. For most homes, this is about 15% of your utility bill after heating and cooling expenses. It's not just showers — hot water is used in washing machines and dishwashers too, and there are ways to cut back when using those appliances as well. Still, if you're taking the average eight-minute shower per day, you're probably using over 17 gallons of water each time.

### COMPARISON OF PLUMBING FIXTURE FLOW RATES

| Plumbing Fixture | Before 1992  | Energy Policy Act of 1992 | UPC & IPC*** Current Standards |
|------------------|--------------|---------------------------|--------------------------------|
| Water Closets    | 4 to 7 gpf*  | 1.6 gpf                   | 1.6 gpf                        |
| Urinal           | 3.5 to 5 gpf | 1.0 gpf                   | 1.0 gpf                        |
| Faucet (aerator) | 5 to 7 gpm** | 2.2 gpm                   | 0.5 gpm                        |
| Shower head      | 4.5 to 8 gpm | 2.5 gpm                   | 2.5 gpm                        |

\*gallons per flush; \*\*gallons per minute; \*\*\*Uniform Plumbing Code, International Plumbing Code

Source: Domestic Water Conservation Technologies, Federal Energy Management Program, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, National Renewable Energy Laboratory, October 2002

- **Take shorter showers.** Even shortening a shower by one minute can save gallons of shower water usage as well as the heating costs associated with showering.
- **Install a low-flow showerhead.** Energy.gov recommends using showerheads with flow rates of less than 2.5 gallons per minute. You can choose between aerating showerheads (which mix air with water to create a misty spray) or laminar-flow showerheads, which form individual water streams. If you have any fixtures that predate 1992, replace them. Showerheads from that time had flow rates of 5.5 gallons per minute. Not sure of your showerhead's flow rate? Try this: place a bucket marked in gallon increments under your showerhead. Turn on the shower and time how many seconds it takes to fill the bucket to the one-gallon mark. If it takes fewer than 20 seconds, you could reduce your shower water usage by installing a low-flow showerhead.
- **Take a "Navy" shower.** You can reduce your shower water usage by turning off the water while you shampoo and lather up. [Home Water Works](#) estimates you can reduce your average shower length impact by as much as five minutes using this technique also known as a combat or military shower.

## RESOURCES/LINKS

Home Depot: How to Change a Shower Head

<https://www.youtube.com/watch?v=rzcAlb5JcXo>

