**Fixtures Installation**

**Description**

Students will learn to install a toilet and lavatory basin.

### Lesson Outcomes

The student will be able to:

* Install a toilet
* Install a lavatory basin

### Assumptions

* The teacher is familiar with fixture installation.
* Fixtures will be installed after a rough-in has been completed.
* This activity will be part of an integrated project that includes water supply and drainage lines.
* Since the procedure for installing fixtures may vary, consult manufacturer’s resources for specific instructions. A number of videos and websites are listed in the “Resources” section.

### Terminology

**Basin**: a hand sink found in a bathroom; also known as a lavatory.

**Fixture**: an object connected to plumbing lines to convey water or drainage.

**Trim**: devices connected to a fixture to facilitate drainage or a supply of water. For example, the trim for a lavatory would be the faucet, drain pipe, and water shut-off valves.

**Water closet**: the traditional term used to refer to a bathroom; in modern terms, it refers to a toilet.

### Estimated Time

2–6 hours

### Recommended Number of Students

Activities could be done individually or in pairs, depending on available fixtures and facilities.



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### Facilities

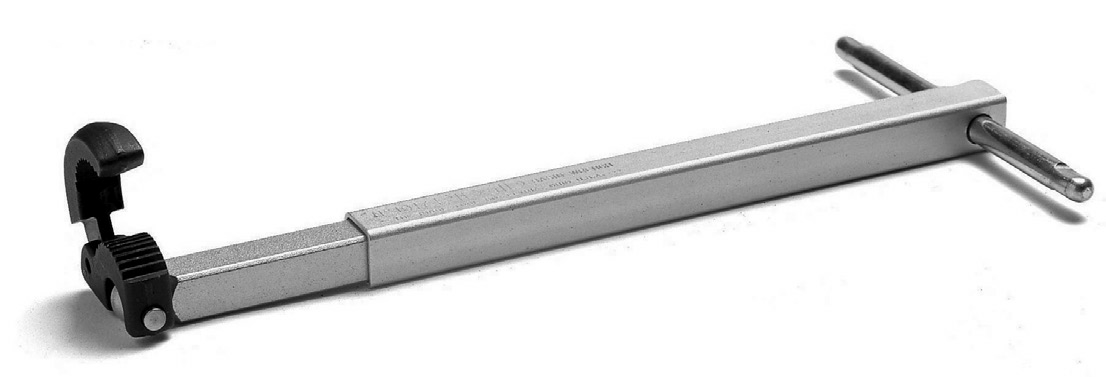
To create a realistic experience, it is suggested that fixture installation be part of an integrated project that includes water lines and a drainage system. This environment could be created

by connecting existing water lines and a drainage system; however, a more mobile option is to drain the piping into a container with a submersible pump. The pump could then recycle the water and pressurize the water system. Another option is portable workstations, which could be constructed on pallets with wheels.

### Tools

A variety of hand tools will be needed. Alternates could be provided based on the level of experience of the students. At the very least, the following tools are suggested:

* + Adjustable wrenches (6", 8", and 12")
  + Water pump pliers
  + Hacksaw
  + Basin wrench (Figure 1)

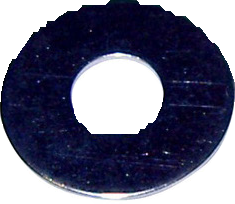
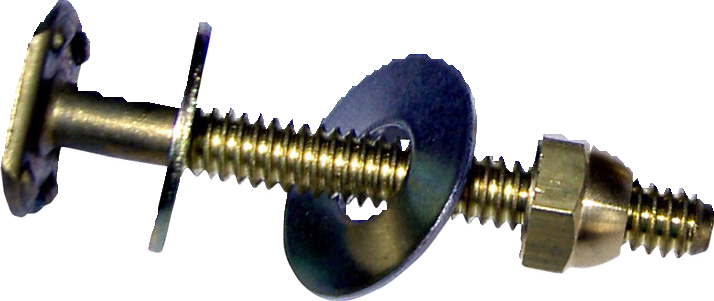


**Figure 1—**A basin wrench is used to reach into areas too difficult for a wrench to fit.

### Materials

#### Toilet installation

* + Toilet bowl and tank
  + Closet T bolts (Figure 2)
  + Braided closet supply tube for toilet (12")
  + Toilet seat
  + Wax or foam toilet seal. Wax seals are most commonly used in industry, but they cannot be reused.



**Figure 2—**Closet bolts will be used to tighten the bowl to the floor flange.

#### Basin installation

* Basin
* Faucet (some models include a drain assembly)
* Tailpiece (drain) assembly (Figure 3)
* 2 braided supply tubes for lavatory (hot and cold water lines will need to be connected)
* 2 CR 19 angle stops
* 1 ABS 1¼ × 1½" slip joint adapter
* 1 ABS 1½" union type p-trap (Figure 5)
* 1 ABS 1½" coupling
* ABS solvent cement
* ABS pipe 1½"
* 3½" chrome escutcheons
* Screws and washers



**Figure 3—**Drain assemblies will include a system for plugging the drain.

It may be a pop-out plug or a mechanically activated plug.

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| **Figure 4—**A mechanical pop-out (PO) plug allows the user to control the drain plug by means of a rod and lever. | **Figure 5—**A union type p-trap has a threaded connection that allows quick removal for cleaning or inspection. It also allows the teacher to reuse this p-trap. |

### Resources

As indicated above, the installation of a toilet and lavatory will vary by manufacturer, so provided documentation should be consulted. Below are a number of guides that may prove useful.

##### How to remove and install a new toilet

<http://www.youtube.com/watch?v=Y_hVZ3rPzm4>

##### How to install a new toilet

<http://www.youtube.com/watch?v=ZRCp8OeL1YQ> <http://www.homedepot.ca/know-how/videos/how-to-install-a-toilet>

##### Toilet installation videos

<http://buildipedia.com/at-home/bathroom/diy-how-to-install-a-toilet>

http://www.kohler.com/video/162/Kohler-Canada/lvl1id?196/Installation/lvl2id?198/Cimarron- Toilet-(English)/playlistid?86130044001/Cimarron-Toilet-(english)/videoid?616339440001/ Cimarron-(TM)-Toilet-Installation--Step-3/

##### Lavatory installation guides

<http://www.rona.ca/en/projects/Installing-a-drop-in-sink-in-a-bathroom-countertop#allSteps>

##### Lavatory installation video

<http://buildipedia.com/at-home/bathroom/how-to-install-a-bathroom-lavatory>

# Activity 1: Installation of Fixtures

The final step in a plumbing installation is the installation of the fixtures. It is the culminating event that provides the most tangible evidence of the correct installation of a plumbing system. This activity can serve as a guide to installing a toilet (also known as a *water closet*) and a basin (a small sink located in a bathroom, also known as a *lavatory*). As addressed in the “facilities” section, a source of water and a location for drainage would allow the fixtures to function.

## Toilet Installation

The following is a general installation procedure. Consult the manufacturer’s documentation or information found in the “Resources” section for greater detail.

1. Turn off the water supply.
   * Cut the water line at a distance of 1½" from the finished wall.
   * Place a small container under the pipe outlet to capture water draining out of the pipe.
2. Install CR 19 angle stops on the toilet supply and lavatory supplies.
   * If PEX piping has been used, crimp the CR 19.
   * If copper piping has been used, use a compression-style CR 19 (Figure 6).
3. If necessary, remove the plug from the toilet flange (Figure 7).
4. Remove the toilet bowl from its packaging.

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| **Figure 6—**A compression-style CR 19 will fit over copper pipe. The chrome nut is then tightened to compress a brass ring, providing a watertight seal. | **Figure 7—**Closet flanges may have plastic plugs in the drain.  A slotted screwdriver and a hammer can quickly remove it. |

1. Place the brass closet bolts in floor flange facing upward (Figure 8).
2. Place the wax seal or foam gasket on the closet flange.
3. Place the closet bolts in the closet flange.
   * Foam gaskets are not normally used in industry, but they provide a cleaner, reusable method to seal the toilet.
4. Place the bowl over the seal and align the closet bolts through the holes.
5. Kneel or sit on the bowl to seat it onto the wax seal.
6. Place the plastic washers, brass washers, and brass nuts on the bolts.
7. Tighten the brass nuts onto the closet bolts. Great care must be taken to ensure the student does not overtighten the nuts and crack the fixture. If the bolts are too long they must be cut off using a hacksaw.
8. Snap the plastic caps onto the washers.
9. Remove the tank from the box.
10. Place the sponge gasket on the plastic horn on the bottom of the tank.
11. Attach the tank to the bowl with the supplied hardware.
12. Connect the tank following the manufacturer’s instructions.
13. Connect the braided water closet supply tube from the CR 19 to the tank.
14. Turn on the water.
15. Flush the toilet.
16. Install the seat.



**Figure 8—**Brass closet bolts are aligned with the floor flange to secure the bowl to the flange.

## Basin Installation

The following is a general installation procedure. Consult the manufacturer’s documentation or information found in the “Resources” section for greater detail.

1. Prepare countertop to receive the lavatory.
   * Cut an opening in the countertop following the manufacturer’s directions.
2. Attach the faucet to the basin (Figure 9).
3. Attach the basin to the countertop.
4. Connect the braided water lines from the CR 19 to the faucet.
5. Connect the drain trim to the basin, following the manufacturer’s directions.
6. Connect the drain to the ABS outlet (Figure 10).



**Figure 9—**Faucets are normally connected to the basin by means of a threaded nut. Braided water supply lines run from the

brass connections to the CR 19 stops.

Braided water supply lines

CR 19 angle stops

Escutcheons can be used to give a more finished look

1½" coupling

Tail piece assembly will connect fixture to p-trap



1¼" × 1½"

Slip joint adapter

1½" p-trap with cleanout

**Figure 10—**Connections to a basin

### Evaluation Guidelines

The student:

* + Uses appropriate safety equipment and procedures.
  + Selects appropriate tool(s) for the task.
  + Produces accurately cut piping to meet given dimensions.
  + Assembles fixtures that function correctly.
  + Produces a watertight piping system.
  + Conducts tidy housekeeping.