**Building Science Education Solution Center – Heat Pump Water Heaters Installation**

Proficiency Level 3: Apply

**Learning Objective 3.1:**

* Prepare to install a heat pump water heater.

**Lecture Notes 3.1:**

The content in this section is adapted from Hot Water Solutions NW. These instructions and interactive content can be accessed at: <https://hotwatersolutionsnw.org/installation/do-it-yourself>

1. Obtain a permit, if necessary

Before installing any water heater, check if the city or county in which the work is being performed requires a permit to perform plumbing or mechanical work. This information can usually be found on the municipality’s website by searching for the permit office. If a permit is required, it usually involves the following steps:

1. Apply for a building permit. Applying for a permit entails submission of information about the work being performed and includes specifying the tasks that are required to complete the work.
2. Prescreen the plans. Prescreening evaluates if the plans submitted contain the minimum requirements to meet building code.
3. Plan review. The municipality reviews the submitted plan and either approves the plans or determines that corrections are required.
4. Pay fees and obtain permit. After plans are reviewed, permit fees must be paid before the permit is issued and work may begin.
5. Evaluate electrical availability

The presence of existing wiring, receptacles, and circuits is a factor in the type of equipment to be installed. The most straightforward case is an installation replacing an existing electric resistance water heater. The most typical electric resistance water heaters use the same voltage wiring and circuit size as a 240-volt, 30-amp heat pump water heater (hybrid water heater).

For installations that do not fit this profile, there are several options depending on the electrical availability. Consider consulting an electrician to evaluate these options. When replacing a fossil-fuel water heater, the most convenient option may be a plug-in 120-volt heat pump water heater. If a receptacle on a shared 15-amp circuit is within 6 to 8 feet (1.8 to 2.4 m), this technology may be a good fit.

If neither option is available, consider the costs and difficulty of running new wiring to the location, adding new circuits to the electrical panel, and potential electrical service upgrades to the home.

1. Select a location

Most often, a heat pump water heater will be replacing a gas-fired or electric resistance water heater and will be installed in the same space. However, there are some additional considerations that might affect installation location, including heat pump water heater dimensions, cool exhaust air, noise, and condensate.

Heat pump technology extracts heat from the surrounding air and exhausts cool air, which may result in cooler temperatures and increased heating needs in winter months if the home’s heating and cooling thermostat is ten feet line of sight from the installation location. Ideal locations for heat pump water heaters are semi-conditioned spaces, such as garages or utility closets. However, the air temperature around the water heater should not drop below 40-degrees Fahrenheit.

Heat pumps use compressors and fans for the refrigerant cycle, which make noise and vibration, and may result in discomfort in the living space. This is another reason that low traffic locations are ideal. Condensate (i.e., pH-neutral water) is produced from normal operation of the heat pump and must be drained away. As such, a location with easy access to a drain or utility sink is ideal. More information on properly locating a HPWH and managing condensate can be found in the module “Decision Guidance for HPWH.”

1. Remove the old water heater and prepare for install

Whether replacing an old water heater or installing in a new construction project, turn the power to the water heater’s circuit off at the electrical panel. This ensures the electrical components are safe to work on.

If removing an old water heater, allow the tank to fully drain to a safe location, a transfer pump may be needed to facilitate the draining of the tank.

Disconnect the supply lines and associated plumbing. Once all the lines and hardware are removed, remove the old water heater.

The heat pump water heater should be installed with at least six inches of clearance from the wall to either air intake or outlet to allow for access to clean the air filter (typically located on top of the unit). Additionally, the plumbing may need to be altered, as many heat pump water heater’s inlet and outlet water lines are located on the side of the unit, not the top, as is typical with traditional water heaters. Some newer models also have top connections available.

Inspect all remaining fittings to make sure they are sound and functional and replace if needed. If replacing the cold-water valve, water to the whole house will need to be shut off at the main valve.

1. Preparing the plumbing

A heat pump water heater may require a couple of changes to the location and plumbing.

1. First, the heat pump water heater may have a larger diameter tank than the old water heater, and six inches of clearance from the wall is recommended. Refer to the installation manual for clearance requirements around the exhaust fan.
2. Second, unlike the old water heater, the water inlet and outlet lines on some heat pump water heaters may be located on the side of the unit instead of on top. Longer supply lines to reach the inlet and outlet may be needed. Use solid pipe and flexible pipe connections if they are permissible according to local code. These do not require soldering, clamps, unions, or glue. Use thread tape on all threaded connections.

If installing the heat pump water heater in a closed water system, which lets water in through the supply line and doesn’t let it back out except through drains and sewer lines, a thermal expansion tank to prevent problems resulting from pressure buildup is needed. Install the temperature and pressure relief valve and a discharge line per the manufacturer’s instructions and local code.

Install a shutoff valve in the cold-water inlet line near the water heater. If flexible connectors are not used, use union fittings to join the hot and cold-water supply lines to make removal of the water heater easier for service or replacement. If required by local code, install a mixing valve or anti-scald device in the domestic hot water line and a pressure reducing valve in the cold-water inlet line. Mixing valves are mechanical devices that mix cold water with hot water leaving the tank such that the temperature is not hot enough to scald a user. Some heat pump water heaters have integrated mixing valves (i.e., pre-installed into the heat pump water heater). Mixing valves and higher tank setpoint temperatures can increase the storage capacity of the water heater, and may be required to qualify for certain rebate or incentive programs.

1. Position the heat pump water heater, then connect and insulate plumbing

Place a rigid foam or rubber pad (this reduces heat loss through the floor and prevents vibration) and drain pan for the heat pump water heater on the floor, or if local code requires, place the drain pan atop a stand. Move the water heater onto the drain pan. Ensure that the control panel is facing outward for easy access. Level the unit using shims, if necessary. If required by local code, install seismic strapping.

With the new water heater in place, connect the supply lines to the cold-water inlet and hot water outlet. Insulate the hot water supply line with a polyethylene or neoprene foam pipe sleeve. This reduces heat loss and can raise water temperature 2–4 °F (1–2 °C) hotter than uninsulated pipes can deliver. Wait time for hot water from faucets and showerheads is also reduced, which helps conserve water and maximize energy savings. If the heat pump water heater is equipped with a leak detection sensor, locate the sensor into the drain pan as described in the installation manual.

1. Address condensate management

Unlike traditional water heaters, heat pump water heaters may produce condensate that needs to be drained. This condensate is neutral, not acidic like furnace condensate. If there is a nearby floor or sink drain, attach PVC pipe to the water heater’s drain port(s), and route the condensate in a downward slope.

If there is not a drain nearby or if drainage cannot be gravity fed, a condensate pump is required. Refer to the manufacturer instructions before connecting the condensate drain line into an existing drain or discharge line. Most condensate pumps can be attached to a wall hanger and plugged into a standard 120 Volt outlet. Ensure that the tubing is connected securely with hose clamps to the pump output, and drains to a suitable termination point. If a drainage pipe is directed outside, make sure the pipe will not freeze by having it terminate at least six inches above the ground, and making sure there are no low spots in the tubing outside. Install the condensate pump per the manufacturer instructions. Verify that the pump is working properly by filling it slowly with water until the pump engages.

1. Fill the tank and complete the electrical connections

Open the cold-water valve slowly at first to make sure there are no leaks. Then, fill the heat pump water heater. Meanwhile, turn on the highest hot water faucet in the house to allow air to escape as the tank is filled, and double-check the piping for leaks. Some rusty water may get pushed through, which is normal. When the hot water faucet in the house has a steady stream, the tank is full. Run the faucet for 3 minutes after a constant flow has been achieved before turning it off.

When the tank is full, connect to the electrical supply according to the manufacturer’s instructions. Use new properly sized wire nuts to connect the wires. Then, turn on the power to the heat pump water heater at the breaker. Use a voltage meter to verify proper voltage per the manufacturer’s instructions. Make sure all cover plates are properly installed.

1. Start the water heater

Most water heaters will go through a self-check and verify that the tank is full of water, that it has sufficient power, and that there are not any errors. This can take up to five minutes (there may be a series of clicks, and the fan may turn on and off). Congratulations! The new heat pump water heater is successfully installed and set to provide years of reliable hot water and savings.

**Problem Set 3.1:**

1. True or false: You probably don’t need a permit to install a heat pump water heater.
2. What are three reasons why installing a heat pump water heater in a conditioned space is not ideal?
3. How many inches of clearance from the wall should the water heater have? Why?
4. What are two ways to further improve the efficiency of a water heater during installation?

**Learning Objective 3.2:**

* Practice how to maintain a heat pump water heater.

**Lecture Notes 3.2:**

Maintaining a heat pump water heater will ensure the unit stays efficient and has a long, reliable life. Perform preventative maintenance on water heater as directed by the manufacturer’s instructions. This may involve:

* Cleaning the heat pump water heater’s air filters by vacuuming the dust and wiping them with a damp cloth, rinsing them underwater, and allowing them to air dry.
* Manually operating the temperature and pressure relief valve to ensure it is working properly.
* Draining and flushing the tank to remove any sediment that has built up at the manufacturer’s specified interval.
* Periodically check plumbing for leaks and corrosion.
* Periodically check the condensate line, and clean if necessary.
* Periodically check the hot water line insulation to make sure it stays in place and in good condition.

**Problem Set 3.2:**

1. True or false: heat pump water heaters don’t need to be maintained.
2. What are three components to check on a regular basis to make sure they are in good working order?