

Hot Water Delivery



Optional Water Efficiency Measure: May contribute to the 30 percent water efficiency requirement, depending on the chosen WaterSense® Approved Certification Method (WACM).



UNDERSTAND

- Efficient hot water delivery (HWD) systems provide hot water to fixtures faster, wasting less time, water, energy, and money.
- To design efficient HWD systems, minimize pipe run lengths and right-size pipe diameters.
- Residential HWD systems come in a variety of design installation methods and materials. Some of the most common are summarized in the table below.

HWD System Description	HWD System Schematic
Trunk-and-branch systems have one or more long, large diameter common flow main lines (trunks) that run from the water heater to the farthest fixture. “Branches” from the main trunk supply hot water to different parts of the house, and “twigs” provide hot water to individual fixtures.	
Core systems rely on a centrally located water heater that can supply fixtures with individual small-diameter pipes.	
Whole-house manifold systems supply a central manifold with a single, short, large-diameter pipe and have small-diameter piping running from the manifold to reach individual fixtures.	
Recirculation systems have a continuous loop of hot water recirculating through the home by means of a circulating pump. Ensuring the recirculation is demand-activated (for example by a push button or motion sensor) ensures that recirculation does not unnecessarily increase the energy used to heat water.	



BUILD

- **DESIGN** a hot water distribution system that meets the needs of the homeowner and achieves performance by considering the layout of the home and the most appropriate type of piping for the system.
- **AIM** to design and install a system that has the lowest volume of water between the water heater and each end use possible. A good target is 0.5 gallons or less between each end use (e.g., shower, faucet).
- **COORDINATE** verification of the HWD system by a WaterSense home verifier, if possible, prior to installation of drywall.



VERIFY

- **VERIFY** the volume and time needed to detect a 10°F temperature change by identifying the fixture farthest from the hot water source. Place a bucket under the hot water fixture, turn the hot water completely on, and use a thermometer to record the starting temperature. Once the water temperature has increased by 10°F, turn off the water. Measure and record the volume of water collected.
- **CONFIRM** that a demand-initiated recirculation pump has been installed, if applicable.

**NOTE: Consult with the Home Certification Organization (HCO) for specific verification protocols.*

Energy-Saving Heat Pumps

Water heaters use about 20 percent of a home's energy. Builders can install an ENERGY STAR® certified heat pump water heater to help reduce energy use associated with heating water. Visit the ENERGY STAR Super-Efficient Water Heater web page at www.energystar.gov/products/energy_star_home_upgrade/super_efficient_water_heater to learn more and find eligible models.



Piping Materials

There are several choices for pipe materials, although their selection may be influenced by the type of system being installed:

- Trunk-and-branch and core systems traditionally use copper pipes but can use any type of piping.
- Whole-house manifold systems use flexible piping, such as types of cross-linked polyethylene (PEX).
- Demand-initiated recirculation systems can use any type of piping.

Consider the effect of pipe diameter on efficiency and performance of the system. For example, smaller diameter piping may be acceptable to deliver water from the main supply line to individual fixtures, whereas the main line requires larger diameter piping to ensure adequate flow.

Pipe insulation can further improve HWD efficiency, as it reduces the overall rate of heat loss from water stored in the piping. Pipe insulation with a minimum R value of R-3 should be used.

Learn More

Check out WaterSense's *Guide for Efficient Hot Water Delivery Systems* at www.epa.gov/watersense/watersense-labeled-homes-hot-water to learn about designing hot water delivery systems to reduce wait times and maximize water efficiency.



This technical fact sheet is part of EPA's *Technical Reference Manual for WaterSense Labeled Homes*. For the full document and other tools and resources for homes, visit www.epa.gov/watersense/tools-and-resources.

EPA-832-F-23-016
July 2023