

**Intent**

Reduce energy consumption associated with the domestic hot water system, including improving the efficiency of both the hot water system design and the layout of the fixtures in the home.

**Requirements****Prerequisites**

None.

**Credits**

**7.1 Efficient hot water distribution** (2 points). Design and install an energy-efficient hot water distribution system (see **Figure 1**). None of the branch length requirements below apply to cold water demand loads (e.g., toilets), washing machines, or tubs without showerheads. Select one of the following designs:

- a. Structured plumbing system. The system must meet all of the following:
  - i. The system must have a demand-controlled circulation loop that is insulated to at least R-4.
  - ii. The total length of the circulation loop must be less than 40 linear feet of plumbing in one-story homes. Add 2x the ceiling height for two-story homes, and add 4x the ceiling height for three- or four-story homes.
  - iii. Branch lines from the loop to each fixture must be  $\leq 10$  feet long and a maximum of  $\frac{1}{2}$ -inch nominal diameter.
  - iv. The system must be designed with a push button control in each full bathroom and the kitchen and an automatic pump shut-off.
- b. Central manifold distribution system. The system must meet all of the following:
  - i. The central manifold trunk must be no more than 6 feet in length.
  - ii. The central manifold trunk must be insulated to at least R-4.
  - iii. No branch line from the central manifold to any fixtures may exceed 20 feet in one-story homes. Add 1x the ceiling height for two-story homes, and add 2x the ceiling height for three- or four-story homes.
  - iv. Branch lines from the manifold must be a maximum of  $\frac{1}{2}$ -inch nominal diameter.
- c. Compact design of conventional system. The system must meet all of the following:
  - i. No branch line from the water heater to any fixtures may exceed 20 feet in one-story homes. Add 1x the ceiling height for two-story homes, and add 2x the ceiling height for three- or four-story homes.
  - ii. Branch lines from the central header to each fixture must be a maximum of  $\frac{1}{2}$ -inch nominal diameter.

**7.2 Pipe insulation** (1 point). All domestic hot water piping shall have R-4 insulation. Insulation shall be properly installed on all piping elbows to adequately insulate the 90-degree bend.

**7.3 Efficient domestic hot water (DHW) equipment** (maximum 3 points). Design and install energy-efficient water heating equipment. Select one measure from **Table 1** below.

**Table 1 High-Efficiency Water Heating Equipment**

Water heater type and efficiency requirement	Description	Points
<b>Gas water heaters</b>		
EF $\geq$ 0.53 (80 gallon)	High-efficiency storage water heater	1
EF $\geq$ 0.57 (60 gallon)	High-efficiency storage water heater	1
EF $\geq$ 0.61 (40 gallon)	High-efficiency storage water heater	1
EF $\geq$ 0.8	Storage or tankless water heater	2
CAE $\geq$ 0.8	Combination water and space heaters	2
<b>Electric water heaters</b>		
EF $\geq$ 0.89 (80 gallon)	High-efficiency storage water heater	1
EF $\geq$ 0.92 (50 gallon)	High-efficiency storage water heater	1
EF $\geq$ 0.93 (40 gallon)	High-efficiency storage water heater	1
EF $\geq$ 0.99	Tankless water heater	2
EF $\geq$ 2.0	Heat pump water heater	3
<b>Solar water heaters (backup)</b>		
$\geq$ 40% of annual DHW load	With preheat tank	2
$\geq$ 60% of annual DHW load	With preheat tank	3