



# Water heating

EAc7 | Possible 6 points

## 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