



ENERGY SAVER

HEAT & COOL

Sizing a New Water Heater

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Is your water heater the right size for you house? | Photo credit ENERGY STAR®

A properly sized water heater will meet your household's hot water needs while operating more efficiently. Therefore, before purchasing a water heater, make sure it's the correct size.

Here you'll find information about how to size these systems:

- Tankless or demand-type water heaters
- Solar water heating system
- Storage and heat pump (with tank) water heaters.

For sizing combination water and space heating systems -- including some [heat pump systems](#), and [tankless coil and indirect water heaters](#) -- consult a qualified contractor.

If you haven't yet considered what type of water heater might be best for your home, learn more about selecting a new water heater.

Sizing Tankless or Demand-Type Water Heaters

[Tankless or demand-type water heaters](#) are rated by the maximum temperature rise possible at a given flow rate. Therefore, to size a demand water heater, you need to determine the flow rate and the temperature rise you'll need for its application (whole house or a remote application, such as just a bathroom) in your home.

First, list the number of hot water devices you expect to use at any one time. Then, add up their flow rates (gallons per minute). This is the desired flow rate you'll want for the demand water heater. For example, let's say you expect to simultaneously run a hot water faucet with a flow rate of 0.75 gallons (2.84 liters) per minute and a shower head with a flow rate of 2.5 gallons (9.46 liters) per minute. The flow rate through the demand water heater would need to be at least 3.25 gallons (12.3 liters) per minute. To reduce flow rates, install low-flow water fixtures.

To determine temperature rise, subtract the incoming water temperature from the desired output temperature. Unless you know otherwise, assume that the incoming water temperature is 50°F (10°C). For most uses, you'll want your water heated to 120°F (49°C). In this example, you'd need a demand water heater that produces a temperature rise of 70°F (39°C) for most uses. For dishwashers without internal heaters and other such applications, you might want your water heated at 140°F (60°C). In that case, you'll need a temperature rise of 90°F (50°C).

Most demand water heaters are rated for a variety of inlet temperatures. Typically, a 70°F (39°C) water temperature rise is possible at a flow rate of 5 gallons per minute through gas-fired demand water heaters and 2 gallons per minute through electric ones. Faster flow rates or cooler inlet temperatures can sometimes reduce the water temperature at the most distant faucet. Some types of tankless water heaters are thermostatically controlled; they can vary their output temperature according to the water flow rate and inlet temperature.

Sizing a Solar Water Heating System

Sizing your [solar water heating system](#) basically involves determining the total collector area and the storage volume you'll need to meet 90%–100% of your household's hot water needs

during the summer. Solar system contractors use worksheets and computer programs to help determine system requirements and collector sizing.

Collector Area

Contractors usually follow a guideline of around 20 square feet (2 square meters) of collector area for each of the first two family members. For every additional person, add 8 square feet (0.7 square meters) if you live in the U.S. Sun Belt area or 12-14 square feet if you live in the northern United States.

Storage Volume

A small (50- to 60-gallon) storage tank is usually sufficient for one to two three people. A medium (80-gallon) storage tank works well for three to four people. A large tank is appropriate for four to six people.

For active systems, the size of the solar storage tank increases with the size of the collector -- typically 1.5 gallons per square foot of collector. This helps prevent the system from overheating when the demand for hot water is low. In very warm, sunny climates, some experts suggest that the ratio should be increased to as much as 2 gallons of storage to 1 square foot of collector area.

Other Calculations

Additional calculations involved in sizing your solar water heating system include evaluating your building site's solar resource and determining the proper orientation and tilt of the solar collector. Visit the [solar water heaters](#) page for more on these calculations.

Sizing Storage and Heat Pump (with Tank) Water Heaters

To properly size a [storage water heater](#) for your home -- including a [heat pump water](#) heater with a tank -- use the water heater's first hour rating. The first hour rating is the number of gallons of hot water the heater can supply per hour (starting with a tank full of hot water). It depends on the tank capacity, source of heat (burner or element), and the size of the burner or element.

The [EnergyGuide label](#) lists the first hour rating in the top left corner as "Capacity (first hour rating)." The Federal Trade Commission requires an EnergyGuide label on all new conventional storage water heaters but not on heat pump water heaters. Product literature from a manufacturer may also provide the first hour rating. Look for water heater models with a first hour rating that matches within 1 or 2 gallons of your peak hour demand -- the daily peak 1-hour hot water demand for your home.

To estimate your peak hour demand:

- Determine what time of day (morning, noon, evening) you use the most hot water in your home. Keep in mind the number of people living in your home.
- Use the worksheet below to estimate your maximum usage of hot water during this one hour of the day—this is your peak hour demand. Note: the worksheet does not estimate total daily hot water usage.

The worksheet example shows a total peak hour demand of 36 gallons. Therefore, this household would need a water heater model with a first hour rating of 34 to 38 gallons.

Worksheet for Estimating Peak Hour Demand/First Hour Rating

*

USE	AVERAGE GALLONS OF HOT WATER PER USAGE		TIMES USED DURING 1 HOUR		GALLONS USED IN 1 HOUR
Shower	10	×		=	
Shaving (.05 gallon per minute)	2	×		=	
Hand dishwashing or food prep (2 gallons per minute)	4	×		=	
Automatic dishwasher	6	×		=	
Clothes washer	7	×		=	
			Total Peak Hour Demand	=	

EXAMPLE

3 showers	10	×	3	=	30
1 shave	2	×	1	=	2
1 hand dishwashing	4	×	1	=	4
Peak Hour Demand				=	36

Adapted from information from the Federal Energy Management Program Energy Cost Calculator.

*The above worksheet is based on standard usage with no water conservation measures.

[Learn More](#) [Links](#)

- [Tips: Water Heating](#)
- [Selecting a New Water Heater](#)
- [Tankless or Demand-Type Water Heaters](#)
- [Solar Water Heaters](#)
- [Storage Water Heaters](#)
- [Heat Pump Water Heaters](#)
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REBATES & TAX CREDITS

A federal tax credit is available for **solar water heaters**. The credit is for 30% through 2019, then decreases to 26% for tax year 2020, then to 22% for tax year 2021. It expires December 31, 2021. [Learn more](#) and [find state and local incentives](#).

The federal tax credit for other water heaters expired at the end of 2016. If you installed an [eligible water heater](#) in 2015 or 2016, file [form 5695](#) with your taxes to claim the credit.

DIY PROJECTS: WATER HEATING

Savings Project: Lower Water Heating Temperature

Savings Project: Insulate Hot Water Pipes for Energy Savings

Savings Project: Insulate Your Water Heater Tank

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