

Buyer's Guide

Natural Gas Water Heaters



A water heater can be the second largest energy user in your home, after your heating and cooling system. That's why it's important to make a wise choice when you are replacing an existing water heater or purchasing a new home with a choice of equipment.

To determine the actual costs of using a water heater, you should compare the purchase prices of the models you are considering and their lifetime operating costs. In most parts of the country, a natural gas water heater can operate for about half the cost of an electric water heater, although the natural gas unit may cost a little more to buy. Natural gas water heaters come in a wide range of sizes and features so you can easily select one that meets your family's needs.

This publication will help you find the natural gas water heater that is right for your home and your budget.

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Steps For Selecting a Natural Gas Water Heater

- Decide which type of natural gas water heater will work best for your home.
- Determine the size you need by using the first hour recovery ratings.
- Compare energy efficiency, operating costs and purchase prices.
- Select the best venting option for your home.
- Be sure that the models you are considering are design-certified by a nationally recognized testing laboratory.
- Choose a qualified installer.
- Maintain and use your water heater properly.

Types Of Natural Gas Water Heaters

Stand-alone natural gas water heaters are available in two general types: storage and tankless. The most common type is a **storage** water heater, which combines a gas burner and an insulated tank to store hot water. A **tankless** water heater uses a natural gas burner to heat water as you need it. It's sometimes referred to as an instantaneous water heater.

Other types of water heaters that depend on the home's heating system are also available. One is a combination system that provides forced-air space heating and water heating, sometimes called a **combo-heater**. Another uses heat from a hot water or steam space-heating system to run a separate hot water system.

Here's a more detailed explanation of each:

Storage Water Heaters

Storage water heaters are the most popular type for residential use in the United States. A storage water heater takes cold water from the home's water supply and moves it to the bottom of the tank, where it's heated by a gas burner controlled by a thermostat. Hot water is lighter than cold water, so the heated water rises to the top of the tank, where a delivery pipe sends it where it's needed. When hot water leaves the tank and colder water replaces it in the bottom of the tank, the burner automatically comes on again to heat the new water. The burner will also come on if the water in the tank drops below a pre-set temperature. A relief valve protects against temperature or pressure that is too high for the tank.

The insulated storage tanks are usually made of steel, and are lined inside with glass or another material to prevent corrosion. The tanks also contain an "anode" rod, composed of one or more metals, which attracts corrosion away from the rest of the tank's components.

Because the water in the storage tank is kept at a constant temperature 24 hours a day, some heat is lost even when no hot water faucet is on. This is called stand-by heat loss. Newer water heaters have more insulation to help reduce stand-by heat loss.

The natural gas burner produces some combustion byproducts -- primarily water vapor and carbon dioxide. These byproducts are vented to the outdoors through a chimney, flue or side-wall vent. The burner is lit by a standing pilot light or by an electronic or spark ignition.

Storage water heaters are free-standing, and their wide variety of venting configurations gives homeowners many choices for location and installation. Some models can even be installed outdoors without any kind of housing or cover. They're a good choice for homes that are converting to a natural gas water heating system from other types, because the installation is relatively simple.

Tankless or Instantaneous Water Heaters

Tankless water heaters can be wall-mounted or free-standing, and are usually located close to where the hot water is used. These compact units have a gas burner that ignites when the hot water faucet is turned on. The burner heats the water instantaneously as it's being used. When the faucet is turned off, the burner shuts off. Tankless models can provide from 2 to 4 gallons of hot water per minute.

Because these tankless units do not store water, they have no stand-by heat loss. This can reduce energy consumption by 20 to 30 percent, compared with storage water heaters, according to the U.S. Department of Energy (DOE).

Instantaneous water heaters can be installed outdoors as well as indoors, and are suitable for vacation homes, cabins or recreational vehicles. They are not the best choice, however, for a family that needs large quantities of hot water during a short time period -- multiple morning showers, for example.

Combo-heaters

Combination water-heating/space-heating units are compact systems that require only one unit to heat water and heat rooms. They are ideal if the space for a water heater and heating system is small.

Storage water heaters are the most popular type for residential use in the United States.

To provide space heating, water is heated by the gas burner and then pumped through a coil of pipe. A fan blows air over this heated coil and the warm air produced is distributed to the house through ducts. The hot water inside the coil is distributed through a separate piping system to the kitchen, bathrooms and laundry.

Properly sized, these "combo-heaters" can provide adequate space and water heating for homes in any part of the country.

Hydronic or Boiler Systems

Homes that use hot water or steam from a gas boiler for space-heating can also use a coil in the boiler to produce hot water for the home. These coils are long pieces of copper tubing that absorb heat from the boiler water to heat the water inside the coil. The difference between this system and the combo-heater is that the hot water or steam from the boiler is circulated through the home to provide heat, rather than warm air. With this system, the boiler has to be operated all year, which could be somewhat inefficient in summer months when a boiler large enough to provide space heating is being used only for water heating.

A similar system uses the same technology to heat the water, but also includes a separate storage tank to hold the heated water. These are sometimes called indirect water heaters.

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Size and Capacity

The best way to determine the size of the equipment you need is the water heater's "first-hour rating" or "recovery rate." This is the maximum amount of hot water that can be heated and supplied in one hour, starting with a cold tank of water. First-hour ratings for natural gas storage water heaters range from 41 to over 131.

Use the chart below to select the first-hour rating that is most appropriate for your home. For example, if your peak-hour demand for hot water is 70 gallons, you should buy a gas water heater that has a recovery rate of 68 to 72 gallons.

Water Heater First Hour Recovery Rate Table					
Water Used For:	Average Gallons Used:	x	Number of Uses/Hour	=	Gallons Used In Peak Hour
Shower	20	x		=	
Bath	25	x		=	
Shaving	3	x		=	
Washing Face/Hands	2	x		=	
Dishwasher	15	x		=	
Hand Dishwashing	5	x		=	
Food Preparation	6	x		=	
Washing Machine	36	x		=	
Total Peak Hour Demand:					

Generally, natural gas water heaters have higher first-hour recovery rates than electric water heaters with the same storage capacity, so when you buy a gas water heater by its first-hour recovery rating, its tank size is usually smaller than a similar electric water heater's tank. Natural gas storage water heaters range in size from 20 to 80 gallons of capacity.

Efficiency Ratings

The energy efficiency of a water heater is stated in terms of its "energy factor" or EF. The EF is the ratio of the energy delivered as hot water compared with the total energy used by the water heater over a typical 24-hour period. The rating takes into consideration the efficiency of the energy source that heats the water, the unit's standby energy

losses, and the energy lost as the unit cycles on and off. The higher the EF, the more energy-efficient the water heater is.

The federal government uses these ratings in energy conservation programs that set minimum efficiency standards for equipment. The EF ratings for all water heaters manufactured in the United States can be found in the *Consumer's Directory of Certified Efficiency Ratings for Residential Heating and Water Heating Equipment*, published twice a year by the Gas Appliance Manufacturers Association in Arlington, Va. The publication, which is usually available in public libraries, also lists first-hour recovery ratings and tank sizes for all water heaters sold in the United States.

In most parts of the country, a natural gas water heater can operate for about half the cost of an electric water heater..

EFs for natural gas water heaters currently range from 0.43 to 0.86, with the mid-size models ranging from 0.52 to 0.65.

Note: While electric water heaters have higher EFs than gas water heaters, that doesn't mean they will be more economic to operate, because electricity costs considerably more than natural gas for the same amount of energy. For 1999, the U.S. Department of Energy (DOE) estimates that natural gas for residential customers on a national average basis will cost \$6.88 per million Btu, a standard measurement of energy. By comparison, electricity is estimated to cost \$24.09 per million Btu.

Cost Comparisons

To determine the actual cost of using a water heater, you should look at both the purchase price of the equipment and its lifetime operating costs. In most parts of the country, a natural gas water heater can operate for about half the cost of an electric water heater, although a natural gas water heater may cost a little more to buy. Similarly, a natu-

Estimated Annual Operating Costs for Natural Gas Water Heaters (in \$)											
Energy Factor:	.45	.47	.49	.51	.53	.55	.57	.59	.61	.63	.65
Cents Per Therm											
50 cents	\$166	159	153	147	141	136	131	127	123	119	115
52 cents	\$173	166	159	153	147	142	137	132	128	124	120
54 cents	\$180	172	165	159	153	147	142	137	133	128	124
56 cents	\$186	179	171	165	158	153	147	142	138	133	129
58 cents	\$193	185	177	170	164	158	152	147	142	138	134
60 cents	\$200	191	183	176	170	163	158	152	147	143	138
62 cents	\$206	198	190	182	175	169	163	157	152	147	143
64 cents	\$213	204	196	188	181	174	168	163	157	152	148
66 cents	\$220	210	202	194	187	180	173	168	162	157	152
68 cents	\$226	217	208	200	192	185	179	173	167	162	157
70 cents	\$233	223	214	206	198	191	184	178	172	166	161
72 cents	\$240	230	220	212	204	196	189	183	177	171	166
74 cents	\$246	236	226	217	209	202	194	188	182	176	171
76 cents	\$278	242	232	223	215	207	200	193	187	181	175
78 cents	\$260	249	238	229	220	212	205	198	192	185	180
80 cents	\$266	255	245	235	226	218	210	203	196	190	184

ral gas water heater with a higher efficiency rating might cost a little more to buy than a gas water heater with a lower EF, but could save you hundreds of dollars over its lifetime in lower operating costs.

One good way to compare equipment is to use the federally required EnergyGuide Label. On a water heater, as on many other appliances, the yellow EnergyGuide Label shows you what it costs to operate each unit on an annual basis, using national average energy prices. The EnergyGuide will also tell you how a particular model compares with other similar models. Be sure to compare water heater models with the same first-hour recovery rating when using the EnergyGuides.

For more specific operating cost estimates, you can figure your annual expense using local costs of energy. Ask your sales person or a utility representative for actual energy costs in your area, or check your latest gas bill. Residential gas prices are usually calculated in units called therms. (Atherm is equal to 100,000 Btu.) Locate your local per/therm cost on the chart below and the estimated therm usage of the water heater. This will give you a good estimate of the appliance's actual yearly energy costs.

You can also use the chart above to determine what the "payback" period is for buying a higher efficiency water heater. For example, if your cost per therm of gas is 70 cents, the difference in annual operating costs for a water heater with an EF of .51 and unit with an EF of .63 is \$57. If the more efficient unit costs \$100 more than the other unit, you would pay yourself back for the initial higher cost through lower operating costs in less than two years. So if you plan to live in your home for longer than 2 years, the higher efficiency model would be the better choice for long-term savings.

Installation and Venting

All natural gas water heaters must be vented to the outdoors to remove the byproducts of combustion. A wide variety of venting options are available, and should be considered when you choose your equipment.

Atmospherically vented gas water heaters are the most common type. Because the flue gases from the water heater are warmer than the surrounding air, they will rise naturally through a vertical vent pipe or chimney to the outdoors. These units don't need help from fans or other mechanical boosters, which keeps installation and operating costs down. All atmospherically vented gas water heaters can use either a standard metal vent or a masonry chimney.

Direct-vent or horizontally vented water heaters are designed for installations where vertical chimneys or flues are not available or would be more expensive to install. The vents go directly through an outside wall, and can also bring in combustion air to the gas burner. Most of these units require zero-clearance at the sides and rear, which allows them to be installed in a small area.

Fan-assisted or power-vented gas water heaters use an electric fan or blower to push combustion gases to the outdoors. This type of venting allows gas water heaters to be installed as far as 40 feet away from an outside wall and in homes without existing vertical vents. The flue or vent pipe can be hidden behind walls and cabinets. Other gas equipment can be installed with the water heater and use the same power venting system.

If you wish to move a water heater to a different location in your home where natural gas piping is not available, your contractor may recommend using corrugated stainless steel tubing (CSST) to provide the gas supply. This relatively new technology is flexible and more economical installation in existing buildings, and is as strong and safe as traditional rigid metal piping.

Selecting a Qualified Contractor

Water heaters must be installed according to the manufacturer's instructions and vented to comply with all local building codes and regulations. To locate a qualified plumber or contractor, call your local gas utility and ask for a list of names; ask your neighbors or friends for names; or look in the Yellow Pages. Be sure to ask contractors for references and to check with the Better Business Bureau to make sure that the contractor is properly licensed and bonded.

Your contractor should comply with local codes and regulations, obtain all necessary permits and be up-to-date on current technology and venting procedures.

Proper Use and Maintenance

Proper care and use of your gas water heater will help save energy and money, and give you a reliable supply of hot water for many years. Here are some guidelines:

- Keep the area around your water heater clean and well ventilated. Don't store papers, clothing or any other flammable materials near the water heater.
- Sediment and mineral accumulations on the tank bottom can reduce performance. Water heater manufacturers recommend that you run a quantity of water through the water heater drain valve regularly. See manufacturers' instructions for details.
- The anode rod that is placed in the water heater as an anti-corrosion device should be checked once a year and replaced when necessary by a qualified technician.
- When having your natural gas heating system inspected annually, ask the technician to also inspect your gas water

heater and its venting system for any problems.

- Homeowners can also do their own inspections by checking for rust or corrosion on the vents or the appliance. A properly adjusted natural gas burner will look like the familiar blue flame. An orange or yellow flame indicates improper combustion, and the appliance should be checked by a qualified technician.

Reducing Water Heater Operating Costs

- Repair leaky hot water faucets and pipes. One drop per second from a leaky faucet can cost \$1 per month, according to DOE, and the leak can usually be repaired easily.
- Install water flow restrictors in your showerheads. Older showerheads deliver from 4 to 5 gallons of water per minute. Current federal regulations require a flow rate of 2.5 gallons per minute. DOE estimates a 30 percent reduction in hot water use with a low-flow showerhead.
- Use warm or cold water to wash clothing, unless it's heavily soiled, and use cold water for the rinse cycle.
- Run the dishwasher and washing machine only when you have full loads.
- Take short showers rather than baths.
- Don't run hot water continuously when washing your face or shaving.
- Use the cold water faucet when just a little water is needed. If you use the hot water tap, the small amount of hot water drawn into the cold pipes never reaches the faucet and heat is wasted.
- If your dishwasher has a "booster" heater for its water supply, you can use it and set your water heater temperature at 120 degrees F. That's hot enough for all other household uses. For each 10 degrees you reduce the temperature setting, you'll reduce energy use by 3 to 5 percent, according to DOE.
- If you have an older water heater in a cold area, you can save money and energy by installing a fiberglass insulation jacket around your water heater and the water pipes. Don't cover air inlets, valves, faucets, controls or pipes at the bottom or at the top near the exhaust vent. Follow the manufacturer's installation instructions.

Safety Tips

Temperature Settings

Water heaters are shipped with the temperature setting at its lowest point, usually 120 degrees F. Keeping the temperature at 120 degrees F will save energy and reduce the risk of hot water burns.

However, manufacturers of dishwashing equipment usually recommend a water temperature of 140 degrees F for best results. If you have a "booster" heater on your dishwasher, you can lower the water heater temperature. Otherwise, it is not recommended.

To avoid the potential for hot water scalding, you also can install special valves that will send 140 degree water to the dishwasher, and mix tap water with hot water to reduce the temperature of water going to bathrooms and sinks.

To check your water temperature, let the hot water run for 3 to 5 minutes from a bathtub faucet. Check the water temperature with a reliable candy or meat thermometer. Repeat the test in the kitchen and other bathrooms in the home. Adjust your water heater thermostat if necessary.

If you have small children in the home, you might want to consider installing safety shut-off devices on individual faucets. These devices stop the flow of water below the point where scalding burns can occur.

Flammable Vapors

Flammable liquids like gasoline and turpentine will ignite from any open flame, including a water heater pilot light or other types of ignition. Vapors from these flammable products can travel invisibly to a source of ignition. Flammable liquids should never be used in an enclosed area such as a basement or garage, and should never be stored near appliances.

Glossary

atmospheric venting: venting of combustion byproducts through a vertical metal pipe or masonry chimney. Because combustion byproducts are warmer than the surrounding air, they rise naturally to dissipate in the atmosphere.

boiler: a self-contained gas-burning appliance for supplying steam or hot water for heating

Btu: British thermal unit, a common measurement of energy content, equals the amount of energy needed to raise the temperature of 1 pound of water 1 degree Fahrenheit

chimney: one or more passageways, vertical or nearly so, for conveying flue or vent gases to the outside atmosphere

combo heater: a single gas appliance that provides forced-air space-heating and hot water

CSST: corrugated stainless steel tubing, a flexible piping used instead of rigid black pipe to distribute natural gas within a building

degree rise: the difference in temperature between the water at the beginning and end of the heating cycle

dip-tube: the pipe that carries incoming cold water to the bottom of a water heater tank

direct-vent: equipment designed to have all combustion gases vented through an exterior wall. Direct vent equipment can also have a second pipe that brings air from the outside into the combustion chamber. These units are also called "sealed combustion" units.

DOE: the U.S. Department of Energy

energy factor (EF): a measurement of water heater energy efficiency based on how efficiently the energy source heats water, the unit's standby losses and the energy lost as the unit cycles on and off

flue: a passage to take combustion products from a fuel-burning appliance to the outdoors

foot-print: the area of floor space taken up by the water heater

hydronic: a term for heating systems that use circulated hot water or steam created by a boiler

input rating: the amount of fuel energy that flows into a gas appliance over time. It is usually measured in Btu per hour.

masonry chimney: a chimney of solid masonry units, including brick, stone or other materials, usually lined with clay or metal flues

pilot: a small flame used to ignite the gas in the main burner of an appliance. A pilot may be standing (constantly burning) or intermittent (on demand).

sealed combustion: a combustion system in which all the combustion air is drawn from the outside and all combustion byproducts are returned to the outside

standby energy loss: the heat lost from hot water as it sits in the storage tank

vent: a passageway used to carry flue gases away from gas equipment or its vent connectors to the outside atmosphere

Water Heater Manufacturers & Web Sites

American Water Heater www.americanwaterheater.com
Ace, American, American Hardware, America's Best, Apex, Aqua Temp, Aqua-therm, Aquamatic, Best, Best Deluxe, Champion, Craftmaster, De-Limer, Deluxe, Eagle, The Earl's Energy Conservation Water Heater, The Earl's Energy Saver Plus, Envirotemp, Four Most, Hotmaster, Hotstream, King-Kleen, King-Line, Master Plumber, Nationaline, Nautilus, Neptune, Penguin, Polaris, Prestige, Proline, Quaker, Quick Flo, Raywall, Revere, Riviera, Sands, Sentinel, Servi-Star, Shamrock, Special Deluxe, Standard Super Eagle, Super Flow, Supreme, Sure-Fire, Thoro-Clean, Tru-Test, Tru Value, U.S. Supply, XCL Energy Saver

Apollo Comfort Products

Bock Water Heaters

Bosch www.boschappliances.com

Bradford-White www.bradfordwhite.com

GlowCore www.glowcore.com

GSW Water Heating www.gsw-wh.com
GSW, John Wood, Moffat, Medal, Superflue

Heat Transfer Products www.htproducts.com

Lennox www.davelennox.com

Lockinvar Water Heater
Energy Saver, Golden Knight, Knight

Maytag www.maytag.com

Pottstown Water Heater
Energyguard

Reliance Water Heater
Ace, Ambassador, Century, Crosley, Energy Stretcher, Energy USA, Hardware House, Master Plumber/True Value, Mission, Nationaline, President, Regency, Reliance, Renfield, Satellite, Sentry, Superior, The Plumbery, Thermo-King, Top Line, Ultima

Rheem www.rheem.com
Aqua Therm, Energy Master, Professional, Vanguard, Western Auto,

Richmond Water Heaters

Ruud
Professional, Ruudglass Riviera

Seahorse

A.O. Smith www.hotwater.com
Glascote, National, Perma-Glas

State Industries www.stateind.com

Summit Manufacturing Mortex
Sun Therm

Sutherland Lumber
Cimarron

Takagi www.takagiusa.com

Teledyne-Laars www.teledynelaars.com

U.S. Craftmaster Water Heaters

Ace, American Hardware, America's Best, Apex, Aqua Temp, Aqua-therm, Aquamatic, Best, Craftmaster, De-Limer Deluxe, Eagle, The Earl's Energy Conservation Water Heater, The Earl's Energy Saver Plus, Envirotemp, Four Most, Hotmaster, Hotstream, King-Kleen, King-Line, Master Plumber, Nationaline, Neptune, Penguin, Prestige, Proline, Quaker, Quick Flo, Raywall, Revere, Riviera, Sands, Sentinel, Servi-Star, Shamrock, Special Deluxe, Standard Super Eagle, Super Flow, Supreme, Sure-Fire, Thoro-Clean, Tru-Test, Tru Value, U.S., U.S. Craftmaster, U.S. Supply, XCL Energy Saver

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