

The U.S. Department of Energy's (DOE) Federal Energy Management Program (FEMP) facilitates the Federal Government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship.

## PURCHASING SPECIFICATIONS FOR ENERGY-EFFICIENT PRODUCTS

### Commercial Gas Water Heaters

#### Legal Authorities

Federal agencies are required by the National Energy Conservation Policy Act (P.L. 95-619), Executive Order 13423, and Federal Acquisition Regulations (FAR) Subpart 23.2 and 53.223 to specify and buy ENERGY STAR® qualified products or, in categories not included in the ENERGY STAR program, FEMP designated products, which are among the highest 25 percent of equivalent products for energy efficiency.

Performance Requirements for Federal Purchases		
Product Type	Rated Input (Btu/h)	Thermal Efficiency <sup>a</sup>
Storage <sup>b</sup>	75,000 or greater	94% or greater
Instantaneous <sup>c</sup>	200,000 or greater	94% or greater
Hot Water Supply Boiler <sup>d</sup>	300,000 to 12,500,000	94% or greater

- a) Thermal efficiency is the ratio of heat transferred to water flowing through the water heater to the amount of energy consumed by the water heater as measured by the thermal efficiency test procedure contained in ANSI Z21.10.3-1998.
- b) A self-contained unit that heats and stores water within the appliance at thermostatically-controlled temperature for delivery upon demand.
- c) A water heater with an input rating of at least 4,000 British thermal unit per hour (Btu/h) of stored water.
- d) A packaged boiler with an input rating from 300,000 to 12,500,000 Btu/h (at least 4,000 Btu/h per gallon of water stored) and is intended for heating potable water.

#### Buying Energy-Efficient Commercial Gas Water Heaters

This *Specification* applies to commercial gas water heaters. Commercial oil, electric resistance, and heat pump water heaters are excluded. Residential water heaters are covered by separate purchasing specifications. When purchasing commercial gas water heaters, specify or select models that meet the *Performance Requirements* shown above. Information on commercial gas water heaters can be found in the Air Conditioning, Heating, and Refrigeration Institute's (AHRI) Directory of Certified Product Performance at [ahrinet.org](http://ahrinet.org). The Federal supply source for commercial gas water heaters is the General Services Administration (GSA). GSA sells commercial gas water heaters through its Multiple Awards Schedule program and online shopping network, *GSA Advantage!*

These requirements apply to all forms of procurements, including: guide and project specifications; construction, renovation, repair, energy service, operations and maintenance (O&M) contracts; lease agreements and solicitation offers. Energy performance requirements should be included in all evaluations of solicitation responses. Buyers shall insert the standard clause from FAR section 52.223-15 into contracts and solicitations that deliver, acquire, furnish, or specify energy consuming products for use in Federal facilities. Agencies can claim an exception to these requirements through a written finding that no ENERGY STAR qualified or FEMP designated product is available to meet functional requirements, or that no such product is life cycle cost-effective for the specific application.

#### Buyer Tips

All of the commercial gas water heaters that meet required thermal efficiency levels are condensing models and need a drain line to dispose of condensate. Some combustion byproducts cause this condensate to be acidic, which can be corrosive to certain materials. Plastic piping typically used in new construction is not impacted by this. However, in existing facilities where cast iron is used, the condensate can damage piping. In these facilities, the drain lines must be replaced with plastic or some other material immune to the effects of the acid. Another option is to install a neutralizer, which is a device containing a base material (e.g., limestone chips) that counters the acid and eliminates the corrosive effects of the condensate. In commercial food service facilities, cleaning agents used during the dish washing process are known to neutralize acids. A neutralizer is not necessary in this situation as long the condensate line from the water heater is connected downstream from the dishwasher.

**For More Information:**

**FEMP**

U.S. Department of Energy, EE-2L  
 1000 Independence Avenue, SW  
 Washington, DC 20585-0121  
 202-586-5772  
[www.femp.energy.gov](http://www.femp.energy.gov)

**FEMP Product Procurement**

[www.femp.energy.gov/procurement](http://www.femp.energy.gov/procurement)

**Lawrence Berkeley National Laboratory**

202-488-2250  
[www.lbl.gov](http://www.lbl.gov)

**California Energy Commission  
 Appliance Database**

[www.appliances.energy.ca.gov](http://www.appliances.energy.ca.gov)

**NIST**

Energy Price Indices and Discount  
 Factors for Life-Cycle Cost Analysis  
[www.femp.energy.gov/pdfs/ashb10.pdf](http://www.femp.energy.gov/pdfs/ashb10.pdf)

**Federal Supply Sources**

**General Services Administration**  
 816-926-6760  
[www.gsa.gov/](http://www.gsa.gov/)  
[www.gsaadvantage.gov/](http://www.gsaadvantage.gov/)

Version 1: September 2010

Condensing water heaters are not compatible with natural draft vent systems. When a standard efficiency gas water heater is replaced with a condensing model, the existing vent system will not work properly. Condensing water heaters are typically power-vented and include a fan that can exhaust combustion gases up to 60 feet horizontally through plastic pipes.

In new construction, condensing water heaters can be vented horizontally through an exterior wall. The end cap of this exhaust must be above the snow line or other obstructions. The vent also must be sloped toward the water heater so that any formed condensate is directed back towards the drain and does not freeze on the end cap, which could block the exhaust.

When planning the layout of a new commercial kitchen or other facility that requires a lot of hot water, locate the end uses (e.g., dishwashers, sinks) as close to the water heater as possible. Heat losses through the distribution system can be substantially reduced by minimizing pipe runs. If possible, insulate hot water pipes to further reduce heat losses.

**User Tips**

To save additional energy, install water-efficient appliances and low-flow plumbing fittings (e.g., faucets, pre-rinse spray valves). In addition to reducing energy use, these devices reduce water consumption and its associated costs (e.g., water and sewer charges).

**Cost-Effectiveness Example**

Performance	Base Model	Required Level	Best Available <sup>a</sup>
Thermal Efficiency	80%	94%	99%
Annual Energy Use (therms)	2,084	1,774	1,684
Annual Energy Cost	\$1,875	\$1,595	\$1,515
Lifetime Energy Cost	\$16,725	\$14,225	\$13,515
<b>Lifetime Energy Cost Savings</b>	—	<b>\$2,500</b>	<b>\$3,210</b>

a) More efficient products may have been introduced to the market after this specification was published

**Cost-Effectiveness Assumptions**

In the example above, the *Annual Energy Use* is based on the ANSI Z21.10.3-1998 test procedure for a 75-gallon storage type water heater assuming a daily hot water demand of 1,000 gallons, 250 days per year of use, and a temperature rise of 80° F. The efficiency of the *Base Model* is the minimum allowed by DOE appliance standards, the efficiency of the *Required* model meets this *Specification*, and the efficiency of the *Best Available* model is from the California Energy Commission (CEC) Appliance Database. The assumed price for natural gas is \$0.90 per therm, the average at Federal facilities in the U.S. *Lifetime Energy Cost* is the sum of the discounted value of the *Annual Energy Cost* based on average usage and an assumed water heater life of 10 years. Future natural gas price trends and a discount rate of three percent are from National Institute of Standards and Technology (NIST) guidelines.

**Using the Cost-Effectiveness Example**

In the example above, the *Required* water heater is cost-effective if its purchase price is no more than \$2,500 above the *Base Model*. The *Best Available* model is cost-effective if its purchase price is no more than \$3,210 above the *Base Model*.