

(Effective until July 1, 2020)

WAC 51-11C-404021 Table C404.2—Minimum performance of water-heating equipment.

**Table C404.2  
Minimum Performance of Water-Heating Equipment**

Equipment Type	Size Category (input)	Subcategory or Rating Condition	Performance Required <sup>a, b</sup>	Test Procedure
Storage water heaters, electric	≤ 12 kW <sup>d</sup>	Resistance	0.93 - 0.00132V, EF	DOE 10 C.F.R. Part 430
	≤ 24 amps and ≤ 250 volts	Heat pump	0.93 - 0.00132V, EF	DOE 10 C.F.R. Part 430
	> 12 kW <sup>d</sup>	Resistance	(0.3 + 27/V <sub>m</sub> ), %/h	Section G.2 of ANSI Z21.10.3
Instantaneous water heaters, electric	All	Resistance	0.93 - 0.00132V, EF	DOE 10 C.F.R. Part 430
Storage water heaters, gas	≤ 75,000 Btu/h	≥ 20 gal	0.67 - 0.0019V, EF	DOE 10 C.F.R. Part 430
	> 75,000 Btu/h	< 4,000 Btu/h/gal	80% E <sub>t</sub> (Q/800 + 110√V) SL, Btu/h	Section G.1 and G.2 of ANSI Z21.10.3
Instantaneous water heaters, gas	> 50,000 Btu/h and < 200,000 Btu/h	≥ 4,000 (Btu/h)/gal and < 2 gal	0.62 - 0.0019V, EF	DOE 10 C.F.R. Part 430
	≥ 200,000 Btu/h <sup>c</sup>	≥ 4,000 Btu/h/gal and < 10 gal	80% E <sub>t</sub>	Section G.1 and G.2 of ANSI Z21.10.3
	≥ 200,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal	80% E <sub>t</sub> (Q/800 + 110√V) SL, Btu/h	
Storage water heaters, oil	≤ 105,000 Btu/h	≥ 20 gal	0.59 - 0.0019V, EF	DOE 10 C.F.R. Part 430
	> 105,000 Btu/h	< 4,000 Btu/h/gal	78% E <sub>t</sub> (Q/800 + 110√V) SL, Btu/h	Section G.1 and G.2 of ANSI Z21.10.3
Instantaneous water heaters, oil	≤ 210,000 Btu/h	≥ 4,000 Btu/h/gal and < 2 gal	0.59 - 0.0019V, EF	DOE 10 C.F.R. Part 430
	> 210,000 Btu/h	≥ 4,000 Btu/h/gal and < 10 gal	80% E <sub>t</sub>	Section G.1 and G.2 of ANSI Z21.10.3
	> 210,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal	78% E <sub>t</sub> (Q/800 + 110√V) SL, Btu/h	
Hot water supply boilers, gas and oil	≥ 300,000 Btu/h and < 12,500,000 Btu/h	≥ 4,000 Btu/h/gal and < 10 gal	80% E <sub>t</sub>	Section G.1 and G.2 of ANSI Z21.10.3
Hot water supply boilers, gas	≤ 300,000 Btu/h and < 12,500,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal	80% E <sub>t</sub> (Q/800 + 110√V) SL, Btu/h	
Hot water supply boilers, oil	≥ 300,000 Btu/h and < 12,500,000 Btu/h	≥ 4,000 Btu/h/gal and > 10 gal	78% E <sub>t</sub> (Q/800 + 110√V) SL, Btu/h	
Pool heaters, gas and oil	All	—	78% E <sub>t</sub>	ASHRAE 146
Heat pump pool heaters	All	—	4.0 COP	AHRI 146
Unfired storage tanks	All	—	Minimum insulation requirement R-12.5 (h • ft <sup>2</sup> • °F)/Btu	(none)

For SI: °C = [(°F) - 32]/1.8, 1 British thermal unit per hour = 0.2931 W, 1 gallon = 3.785 L, 1 British thermal unit per hour per gallon = 0.078 W/L.

<sup>a</sup> Energy factor (EF) and thermal efficiency (E<sub>t</sub>) are minimum requirements. In the EF equation, V is the rated volume in gallons.

<sup>b</sup> Standby loss (SL) is the maximum Btu/h based on a nominal 70°F temperature difference between stored water and ambient requirements. In the SL equation, Q is the nameplate input rate in Btu/h. In the SL equation for electric water heaters, V is the rated volume in gallons and V<sub>m</sub> is the measured volume in gallons. In the SL equation for oil and gas water heaters and boilers, V is the rated volume in gallons.

<sup>c</sup> Instantaneous water heaters with input rates below 200,000 Btu/h shall comply with these requirements if the water heater is designed to heat water to temperatures 180°F or higher.

<sup>d</sup> Electric water heaters with an input rating of 12 kW (40,950 Btu/h) or less that are designed to heat water to temperatures of 180°F or greater shall comply with the requirements for electric water heaters that have an input rating greater than 12 kW (40,950 Btu/h).

[Statutory Authority: RCW 19.27A.025, 19.27A.045, 19.27A.160, and 19.27.074. WSR 16-13-089, § 51-11C-404021, filed 6/15/16, effective 7/16/16. Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-404021, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-404021, filed 2/1/13, effective 7/1/13.]

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Equipment Type	Size Category (input)	Subcategory or Rating Condition	Performance Required <sup>a, b</sup>	Test Procedure
Storage water heaters, electric	≤ 12 kW <sup>d</sup>	Tabletop <sup>e</sup> ≥ 20 gal and ≥ 120 gal	0.93 - 0.00132V, EF	DOE 10 C.F.R. Part 430
		Resistance ≥ 20 gal and ≤ 55 gal	0.960 - 0.0003V, EF	
		Grid-enabled <sup>f</sup> > 75 gal and ≤ 120 gal	1.06 - 0.00168V, EF	
	> 12 kW <sup>d</sup>	Resistance	(0.3 + 27)/V <sub>m</sub> , %/h <sup>g</sup>	Section G.2 of ANSI Z21.10.3
	≤ 24 amps and ≤ 250 volts	Heat pump	2.057 - 0.00113V, EF	DOE 10 C.F.R. Part 430
Instantaneous water heaters, electric	All	Resistance	0.93 - 0.00132V, EF	DOE 10 C.F.R. Part 430
Storage water heaters, gas	≤ 75,000 Btu/h	≥ 20 gal and ≤ 55 gal	0.675 - 0.0015V, EF	DOE 10 C.F.R. Part 430
		> 55 gal and ≤ 100 gal	0.8012 - 0.00078V, EF	
	> 75,000 Btu/h	< 4,000 Btu/h/gal	80% E <sub>t</sub> (Q/800 + 110√V) SL, Btu/h	Section G.1 and G.2 of ANSI Z21.10.3
Instantaneous water heaters, gas	> 50,000 Btu/h and < 200,000 Btu/h	≥ 4,000 (Btu/h)/gal and < 2 gal	0.82 - 0.0019V, EF	DOE 10 C.F.R. Part 430
	≥ 200,000 Btu/h <sup>c</sup>	≥ 4,000 Btu/h/gal and < 10 gal	80% E <sub>t</sub>	Section G.1 and G.2 of ANSI Z21.10.3
	≥ 200,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal	80% E <sub>t</sub> (Q/800 + 110√V) SL, Btu/h	
Storage water heaters, oil	≤ 105,000 Btu/h	≥ 20 gal	0.68 - 0.0019V, EF	DOE 10 C.F.R. Part 430
	> 105,000 Btu/h	< 4,000 Btu/h/gal	78% E <sub>t</sub> (Q/800 + 110√V) SL, Btu/h	Section G.1 and G.2 of ANSI Z21.10.3
Instantaneous water heaters, oil	≤ 210,000 Btu/h	≥ 4,000 Btu/h/gal and < 2 gal	0.59 - 0.0019V, EF	DOE 10 C.F.R. Part 430
	> 210,000 Btu/h	≥ 4,000 Btu/h/gal and < 10 gal	80% E <sub>t</sub>	Section G.1 and G.2 of ANSI Z21.10.3
	> 210,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal	78% E <sub>t</sub> (Q/800 + 110√V) SL, Btu/h	
Hot water supply boilers, gas and oil	≥ 300,000 Btu/h and < 12,500,000 Btu/h	≥ 4,000 Btu/h/gal and < 10 gal	80% E <sub>t</sub>	Section G.1 and G.2 of ANSI Z21.10.3
Hot water supply boilers, gas	≥ 300,000 Btu/h and < 12,500,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal	80% E <sub>t</sub> (Q/800 + 110√V) SL, Btu/h	
Hot water supply boilers, oil	≥ 300,000 Btu/h and < 12,500,000 Btu/h	≥ 4,000 Btu/h/gal and > 10 gal	78% E <sub>t</sub> (Q/800 + 110√V) SL, Btu/h	
Pool heaters, gas and oil	All	—	82% E <sub>t</sub>	ASHRAE 146
Heat pump pool heaters	All	—	4.0 COP	AHRI 146
Unfired storage tanks	All	—	Minimum insulation requirement R-12.5 (h • ft <sup>2</sup> • °F)/Btu	(none)

For SI: °C = [(°F) - 32]/1.8, 1 British thermal unit per hour = 0.2931 W, 1 gallon = 3.785 L, 1 British thermal unit per hour per gallon = 0.078 W/L.

<sup>a</sup>Energy factor (EF) and thermal efficiency (E<sub>t</sub>) are minimum requirements. In the EF equation, V is the rated volume in gallons.

<sup>b</sup>Standby loss (SL) is the maximum Btu/h based on a nominal 70°F temperature difference between stored water and ambient requirements. In the SL equation, Q is the nameplate input rate in Btu/h. In the SL equation for electric water heaters, V is the rated volume in gallons and V<sub>m</sub> is the measured volume in gallons. In the SL equation for oil and gas water heaters and boilers, V is the rated volume in gallons.

<sup>c</sup>Instantaneous water heaters with input rates below 200,000 Btu/h shall comply with these requirements if the water heater is designed to heat water to temperatures 180°F or higher.

<sup>d</sup>Electric water heaters with an input rating of 12 kW (40,950 Btu/h) or less that are designed to heat water to temperatures of 180°F or greater shall comply with the requirements for electric water heaters that have an input rating greater than 12 kW (40,950 Btu/h).

<sup>e</sup>A tabletop water heater is a water heater that is enclosed in a rectangular cabinet with a flat top surface not more than three feet (0.91 m) in height.

<sup>f</sup>A grid-enabled water heater is an electric resistance water heater that meets all of the following:

1. Has a rated storage tank volume of more than 75 gallons.
2. Is manufactured on or after April 16, 2015.
3. Is equipped at the point of manufacture with an activation lock.
4. Bears a permanent label applied by the manufacturer that complies with all of the following:

- 4.1. Is made of material not adversely affected by water.
- 4.2. Is attached by means of nonwater soluble adhesive.
- 4.3. Advises purchasers and end-users of the intended and appropriate use of the product with the following notice printed in 16.5 point Arial narrow bold font: "IMPORTANT INFORMATION: This water heater is intended only for use as a part of an electric thermal storage or demand response program. It will not provide adequate hot water unless enrolled in such a program and activated by your utility company or another program operator. Confirm the availability of a program in your local area before purchasing or installing this product."  
e%/h is the energy consumed to replace the heat loss from the tank while on standby, expressed as a percentage of the total energy in the stored water per hour.

[Statutory Authority: RCW 19.27A.020, 19.27A.025, 19.27A.160 and chapter 19.27 RCW. WSR 19-24-040, § 51-11C-404021, filed 11/26/19, effective 7/1/20. Statutory Authority: RCW 19.27A.025, 19.27A.045, 19.27A.160, and 19.27.074. WSR 16-13-089, § 51-11C-404021, filed 6/15/16, effective 7/16/16. Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-404021, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-404021, filed 2/1/13, effective 7/1/13.]

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