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IECC: TABLE C404.2

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2024 International Energy Conservation Code [CE Project]

Revise as follows:

TABLE C404.2 MINIMUM PERFORMANCE OF WATER-HEATING EQUIPMENT

EQUIPMENT TYPE	SIZE CATEGORY	SUBCATEGORY OR RATING CONDITION	DRAW PATTERN	PERFORMANCE REQUIRED[a]	TEST PROCEDURE[b]
Electric Table-top water heaters[c]	≤12 kW	≥ 20 gal ≤ 120 gal[d]	Very small Low Medium High	UEF ≥ 0.6323 – (0.0058 × Vr) UEF ≥ 0.9188 – (0.0031 × Vr) UEF ≥ 0.9577 – (0.0023 × Vr) UEF ≥ 0.9884 – (0.0016 × Vr)	DOE 10 CFR Part 430 App. E
Electric Storage water heaters[e,f]: resistance and heat pump	≤12 kW	≥ 20 gal ≤ 55 gal[f]	Very small Low Medium High	UEF ≥ 0.8808 – (0.0008 × Vr) UEF ≥ 0.9254 – (0.0003 × Vr) UEF ≥ 0.9307 – (0.0002 × Vr) UEF ≥ 0.9349 – (0.0001 × Vr)	DOE 10 CFR Part 430 App. E
	≤12 kW	> 55 gal ≤120 gal[f]	Very small Low Medium High	UEF ≥ 1.9236 – (0.0011 × Vr) UEF ≥ 2.0440 – (0.0011 × Vr) UEF ≥ 2.1171 – (0.0011 × Vr) UEF ≥ 2.2418 – (0.0011 × Vr)	DOE 10 CFR Part 430 App. E
Electric Storage water heaters[e,f,l]	> 12 kW	-	-	(0.3 + 27/Vm), %h	DOE 10 CFR 431.106 App B
Grid-enabled water heaters[g]	-	>75 gal d	Very small Low Medium High	UEF ≥ 1.0136 – (0.0028 × Vr) UEF ≥ 0.9984 – (0.0014 × Vr) UEF ≥ 0.9853 – (0.0010 × Vr) UEF ≥ 0.9720 – (0.0007 × Vr)	10 CFR 430 Appendix E
Electric Instantaneous water heaters[h]	≤12 kW	< 2 gal[d]	Very small Low Medium High	UEF ≥ 0.91 UEF ≥ 0.91 UEF ≥ 0.91 UEF ≥ 0.92	DOE 10 CFR Part 430
	>12 kW & ≤ 58.6 kW[i]	≤ 2 gal & ≤180ºF	All	UEF ≥ 0.80	DOE 10 CFR Part 430
Gas Storage water heaters[e,l]	≤ 75,000 Btu/h	≥20 gal & ≤ 55 gal[d]	Very small Low Medium High	UEF ≥ 0.3456 – (0.0020 × Vr) UEF ≥ 0.5982 – (0.0019 × Vr) UEF ≥ 0.6483 – (0.0017 × Vr) UEF ≥ 0.6920 – (0.0013 × Vr)	DOE 10 CFR Part 430 App. E
	≤ 75,000 Btu/h	> 55 gal & ≤ 100 gal[d]	Very small Low Medium High	UEF ≥ 0.6470 – (0.0006 × Vr) UEF ≥ 0.7689 – (0.0005 × Vr) UEF ≥ 0.7897 – (0.0004 × Vr) UEF ≥ 0.8072 – (0.0003 × Vr)	DOE 10 CFR Part 430 App. E
	> 75,000 Btu/h and ≤ 105,000 Btu/h [j,k]	≤ 120 gal & ≤180ºF	Very small Low Medium High	UEF ≥ 0.2674-0.0009 x Vr UEF ≥ 0.5362-0.0012 x Vr UEF ≥ 0.6002-0.0011 x Vr UEF ≥ 0.6597-0.0009 x Vr	DOE 10 CFR Part 430 App. E
	> 105,000 Btu/h[k]	-	-	80% Et SL ≤ (Q/800 +110√V), Btu/h	DOE 10 CFR 431.106
Gas Instantaneous water heaters[i]	> 50,000 Btu/h and < 200,000 Btu/h[k]	< 2 gal[d]	Very small Low Medium High	UEF ≥ 0.80 UEF ≥ 0.81 UEF ≥ 0.81 UEF ≥ 0.81	DOE 10 CFR Part 430 App. E
	≥ 200,000 Btu/h[k]	< 10 gal	-	80% Et	DOE 10 CFR 431.106
	≥ 200,000 Btu/h[k]	≥10 gal	-	80% Et SL ≤ (Q/800 +110√V), Btu/h	
Oil Storage water heaters[e,l]	≤ 105,000 Btu/h	≤ 50 gal[d]	Very small Low Medium High	UEF = 0.2509 – (0.0012 × Vr) UEF = 0.5330 – (0.0016 × Vr) UEF = 0.6078 – (0.0016 × Vr) UEF = 0.6815 – (0.0014 × Vr)	DOE 10 CFR Part 430
	> 105,000 Btu/h and ≤ 140,000 Btu/h[l]	≤ 120 gal & ≤180ºF	Very small Low Medium High	UEF ≥ 0.2932-0.0015 x Vr UEF ≥ 0.5596-0.0018 x Vr UEF ≥ 0.6194-0.0016 x Vr UEF ≥ 0.6740-0.0013 x Vr	DOE 10 CFR Part 430 App. E

	>140,000 Btu/h	All	-	80% Et SL ≤ (Q/800 +110√V), Btu/h	DOE 10 CFR 431.106
Oil Instantaneous water heaters[h,l]	≤ 210,000 Btu/h	< 2 gal	-	80% Et EF ≥ 0.59 - 0.0005 x V	DOE 10 CFR Part 430 App. E
	> 210,000 Btu/h	< 10 gal	-	80% Et	DOE 10 CFR 431.106
	> 210,000 Btu/h	≥ 10 gal	-	78% Et SL ≤ (Q/800 +110√V), Btu/h	DOE 10 CFR 431.106
Hot water supply boilers, gas and oil[h]	≥300,000 Btu/h and < 12,500,000 Btu/h	< 10 gal	-	80% Et	DOE 10 CFR 431.106
Hot water supply boilers, gas[i,l]	≥300,000 Btu/h and < 12,500,000 Btu/h	≥ 10 gal	-	80% Et SL ≤ (Q/800 +110√V), Btu/h	DOE 10 CFR 431.106
Hot water supply boilers, oil[h,l]	≥300,000 Btu/h and < 12,500,000 Btu/h	≥ 10 gal	-	78% Et SL ≤ (Q/800 +110√V), Btu/h	DOE 10 CFR 431.106
Pool heaters, gas[d]	All	_[f]	-	82% Et	DOE 10 CFR Part 430 App. P
Heat pump pool heaters	All	50°F db 44.2°F wb outdoor air 80.0°F entering water	-	4.0 COP	DOE 10 CFR Part 430 App. P
Unfired storage tanks	All	-	-	Minimum insulation requirement R-12.5 (h-ft2-°F)/Btu	(none)

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2, °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.

a. Thermal efficiency (Et) is a minimum requirement, while standby loss is a maximum requirement. In the standby loss equation, V is the rated volume in gallons and Q is the nameplate input rate in Btu/h. Vm is the measured volume in the tank in gallons. Standby loss for electric water heaters is in terms of %/h and denoted by the term "S," and standby loss for gas and oil water heaters is in terms of Btu/h and denoted by the term "SL" Draw pattern (DP) refers to the water draw profile in the Uniform Energy Factor (UEF) test. UEF and Energy Factor (EF) are minimum requirements. In the UEF standard equations, Vr refers to the rated volume in gallons.

b. Chapter 6 contains a complete specification, including the year version, of the referenced test procedure.

c. A tabletop water heater is a storage water heater that is enclosed in a rectangular cabinet with a flat top surface not more than three feet (0.91 m) in height and has a ratio of input capacity (Btu/h) to tank volume (gal) < 4000.

d. Water heaters or gas pool heaters in this category are regulated as consumer products by the USDOE as defined in 10 CFR 430.

e. Storage water heaters have a ratio of input capacity (Btu/h) to tank volume (gal)<4000.

f. Efficiency requirements for electric storage water heaters ≤ 12 kW apply to both electric resistance and heat pump water heaters. There are no minimum efficiency requirements for electric heat pump water heaters greater than 12kW or for gas heat pump water heaters.

g. 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 (284 L).
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 non-water 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."

h. Instantaneous water heaters and hot water supply boilers have an input capacity (Btu/h) divided by storage volume (gal) ≥ 4000 Btu/h-gal.

i. Electric instantaneous water heaters with input capacity >12 kW and ≤58.6 kW that have either (1) a storage volume >2 gal(7.6L); or (2) is designed to provide outlet hot water at temperatures greater than 180°F(82ºC); or (3) uses three-phase power has no efficiency standard.

j. Gas storage water heaters with input capacity >75,000 Btu/h (21.98 kW) and ≤105,000 Btu/h (30.77 kW) must comply with the requirements for the >105,000 Btu/h (30.77 kW) if the water heater either (1) has a storage volume >120 gal (454L); (2) is designed to provide outlet hot water at temperatures greater than 180°F (82ºC); or (3) uses three-phase power.

k. Refer to Section C404.2.1 for additional requirements for gas storage and instantaneous water heaters and gas hot-water supply boilers.l. Oil storage water heaters with input capacity>105,000 Btu/h (30.77 kW) and ≤140,000 Btu/h (41.03 kW) must comply with the requirements for the >140,000 Btu/h (41.03 kW) if the water heater either (1) has a storage volume > 120 gal(454L); (2) is designed to provide outlet hot water at temperatures greater than 180ºF (82ºC); or (3) uses three-phase power.

l. Water heaters and hot water supply boilers having more than 140 gallons of storage capacity need not meet the standby loss requirement if: (1)

The tank surface area is thermally insulated to R-12.5 or more; (2) a standing pilot light is not used; and (3) for gas or oil-fired storage water heaers, they have a fire damper or fan-assisted combustion.

Reason: This proposal updates Table C404.2 to reflect energy conservation standards per Department of Energy (DOE) 10 CFR 431.110 which were missing from Table C404.2.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction.
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