Table 7.8 Performance Requirements for Water-Heating *Equipment*—Minimum *Efficiency* Requirements

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Performance Required [a]	Test Procedure[b,c]
Electric table-top water heaters	≤12 *kW*	Resistance ≥20 gal	EF = 0.93 - 0.00132V	from 10 CFR, P430
Electric *water heaters*	≤12 *kW*[e]	Resistance ≥20 gal	EF = 0.960-0.0003V	from 10 CFR, P430
	>12 *kW*[e]	Resistance ≥20 gal	0.3 + 27/Vm %/h	Section G.2 of ANSI Z21.10.3
	≤24 Amps and ≤250 Volts	Heat pump	See footnote (g).	
Gas storage *water heaters*	≤75,000 Btu/h	≥20 gal	EF = 0.8012-0.00078V	from 10 CFR, P430
	>75,000 Btu/h[f]	<4000 (Btu/h)/gal	SL (Q/800 + 110$\sqrt{V}$) 80% E_t	Sections G.1 and G.2 of ANSI Z21.10.3
Gas instantaneous *water heaters*	>50,000 Btu/h and <200,000 Btu/h	≥4000 (Btu/h)/gal and <2 gal	EF = 0.82-0.0019V	from 10 CFR, P430
	≥200,000 Btu/h[d,f]	≥4000 (Btu/h)/gal and <10 gal	80% E_t	Sections G.1 and G.2 of ANSI Z21.10.3
	≥200,000 Btu/h[f]	≥4000 (Btu/h)/gal and ≥10 gal	SL (Q/800 + 110$\sqrt{V}$) 80% E_t	
Oil storage *water heaters*	≤105,000 Btu/h	≥20 gal	See footnote (g).	
	>105,000 Btu/h	<4000 (Btu/h)/gal	SL (Q/800 + 110$\sqrt{V}$) 80% E_t	Sections G.1 and G.2 of ANSI Z21.10.3
Oil instantaneous *water heaters*	≤210,000 Btu/h	≥4000 (Btu/h)/gal and <2 gal	See footnote (g).	
	>210,000 Btu/h	≥4000 (Btu/h)/gal and <10 gal	80% E_t	Sections G.1 and G.2 of ANSI Z21.10.3
	>210,000 Btu/h	≥4000 (Btu/h)/gal and ≥10 gal	78% E_t (Q/800 + 110$\sqrt{V}$) SL, Btu/h	
Hot-water supply *boilers*, gas and oil[f]	≥300,000 Btu/h and <12,500,000 Btu/h	≥4000 (Btu/h)/gal and <10 gal	80% E_t	Sections G.1 and G.2 of ANSI Z21.10.3
Hot-water supply *boilers*, gas[f]		≥4000 (Btu/h)/gal and ≥10 gal	SL (Q/800 + 110$\sqrt{V}$) 80% E_t	Sections G.1 and G.2 of ANSI Z21.10.3
Hot-water supply *boilers*, oil		≥4000 (Btu/h)/gal and ≥10 gal	78% E_t (Q/800 + 110$\sqrt{V}$) SL, Btu/h	Sections G.1 and G.2 of ANSI Z21.10.3
Pool heaters, oil and gas	All		See footnote (g).	ASHRAE 146
Heat pump *pool* heaters	All	50°F db 44.2°F wb *Outdoor air* 80.0°F entering water	4.0 *COP*	AHRI 1160
Unfired storage tanks	All		R-12.5	(none)

a. Thermal *efficiency* (E_t) is a minimum requirement, while standby loss (SL) is maximum Btu/h based on a 70°F temperature difference between stored water and ambient requirements. In the SL equation, V is the rated volume in gallons and Q is the nameplate input rate in Btu/h. V_m is the measured volume in the tank in gallons.

b. Section 12 contains a complete specification, including the year version, of the referenced test procedure.

c. Section G.1 is titled "Test Method for Measuring Thermal *Efficiency*" and Section G.2 is titled "Test Method for Measuring Standby Loss."

d. Instantaneous *water heaters* with input rates below 200,000 Btu/h must comply with these requirements if the *water heater* is designed to heat water to temperatures of 180°F or higher.

e. Electric *water heaters* with input rates below 12 *kW* must comply with these requirements if the *water heater* is designed to heat water to temperatures of 180°F or higher.

f. Refer to Section 7.5.3 for additional requirements for gas storage and instantaneous *water heaters* and gas *hot-water supply boilers*.

g. In the U.S., the *efficiency* requirements for *water heaters* or gas *pool* heaters in this category or subcategory are specified by the U.S. Department of Energy. Those requirements and applicable test procedures are found in the Code of Federal Regulations 10 CFR Part 430.

Informative Note: See Informative Appendix F for the U.S. Department of Energy *efficiency* requirements applicable to these *water heaters* and *pool* heaters.

Service Water Heating Compliance Report

Project Name:		
Project Address:		Date:
Designer of Record:	Email:	Telephone:
Contact Person:	Email:	Telephone:
City:		

Mandatory Provisions Checklist

- ❑ Load calculations have been provided for sizing of systems and equipment. (Section 7.4.1)
- ❑ Equipment efficiencies meet or exceed the requirements of Table 7.8. (Section 7.4.2)
- ❑ Circulating systems are fully insulated (per Table 6.8.3-1) and have automatic pump controls. (Sections 7.4.3 and 7.4.4.2)
- ❑ Noncirculating systems have heat traps (Section 7.4.6) and outlet piping insulation (per Table 6.8.3-1) for 8 ft (2.4 m) from the storage tank. (Section 7.4.3)

All water heating systems have temperature controls that are adjustable down to 120°F (49°C) or lower. (Section 7.4.4.1)

Systems designed with pipe heating systems such as heat trace have temperature or time controls. (Section 7.4.4.2)

Public lavatories have outlet temperature controls that limit the discharge temperature to 110°F (43°C). (Section 7.4.4.3)

Tanks with remote heaters have circulation pump controls. (Section 7.4.4.4)

Not applicable per VBBL Book I, Div B, Article 10.2.2.2. See Book II, Div B, Section 2.6.

- ❑ Pool heaters have readily accessible controls and gas-fired heaters do not have standing pilot lights. (Section 7.4.5.1)
- ❑ Heated swimming pools have vapor-retardant covers. (Section 7.4.5.2)
- ❑ Pool heaters and circulation pumps have time switches. (Section 7.4.5.3)

Equipment Efficiency Worksheet (Section 7.4.1)

System Tag	Equipment Type (From Table 7.8)	Subcategory or Rating Condition (From Table 7.8)	Input Rating (Btu/h or kW)	Volume (gal or L)	Energy Factor (EF) or thermal efficiency (E_t) Rated ≥ Required	Standby Loss Specified ≤ Nameplate
					≥	≤
					≥	≤
					≥	≤
					≥	≤

Combination Space and Water Heating Worksheet (Section 7.5.1)

System Tag	Standby Loss Method Equipment ≤ Requirement	or Energy Use Exception (attach calculations) Equipment < Requirement	or Size Exception Equipment < Requirement
	≤	<	< 150,000 Btu/h (44 kW)
	≤	<	< 150,000 Btu/h (44 kW)
	≤	<	< 150,000 Btu/h (44 kW)
	≤	<	< 150,000 Btu/h (44 kW)