ERRATA SHEET FOR
ANSI/ASHRAE/IES STANDARD 90.1-2013 (I-P Edition)
Energy Standard for Buildings Except Low-Rise Residential Buildings

April 9, 2025

The corrections listed in this errata sheet apply to ANSI/ASHRAE/IES Standard 90.1-2013, I-P Edition. The first printing is identified on the outside back cover of the standard as "Product code: 86273 10/13", the second printing as "Product code: 86273 12/13 *Errata noted in the list dated 12/9/13 have been corrected*.", and the third printing as "Product code: 86273 3/16 *Errata noted in the list dated 3/10/2016 have been corrected.*". The shaded items have been added since the previously published errata sheet dated June 15, 2023 was distributed.

Items identified with an asterisk "*" apply only to the first printing, they have already been incorporated into the second printing.

Items identified with two asterisk "**" apply only to the third printing.

NOTICE: ASHRAE now has a list server for Standing Standards Project Committee 90.1 (SSPC 90.1). Interested parties can now subscribe and unsubscribe to the list server and be automatically notified via e-mail when activities and information related to the Standard and the User's Manual is available. To sign up for the list server please visit **Project Committee List Servers for Standard** on the Technology / Standards section of the ASHRAE website at https://www.ashrae.org/technical-resources/standards-and-guidelines/project-committee-list-servers.

Page(s)	Erratum
1*	**CONTENTS.** In the table of contents change Informative Appendix G to Normative Appendix G.
3*	**3.2 Definitions.** Add the following definition to Section 3.2: *(Note: Additions are shown in underline.)* ***boiler system:*** one or more boilers and their piping and controls that work together to supply steam or hot water to heat output devices remote from the boiler.
4	**Footnote 1 (bottom of page).** Change the URL for the schedules and internal loads as shown below. 1. Schedules and internal loads, by building area type, are located at http://sspc901.ashraepcs.org/documents.php.
20	**3.3 Abbreviations and Acronyms.** In Section 3.3 delete "**ENVSTD** Envelope System Performance Compliance Program".
26	**5.4.3.4 Vestibules.** Add the following exceptions shown below. *(Note: Additions are shown in underline.)* … 8. *Semiheated spaces.*

9. Enclosed elevator lobbies for *building entrances* directly from parking garages.

35* **5.5.3.1.1 Roof Solar Reflectance and Thermal Emittance.** Revise Section 5.5.3.1.1 as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

5.5.3.1.1 Roof Solar Reflectance and Thermal Emittance. Roofs in Climate Zones 1 through 3 shall have one of the following:

a. A minimum three-year-aged solar reflectance of 0.55 and a minimum three-year-aged thermal emittance of 0.75 when tested in accordance with CRRC-1 Standard
b. A minimum Solar Reflectance Index of 64 when determined in accordance with the Solar Reflectance Index method in ASTM E1980 using a convection coefficient of 2.1 Btu/h·ft^2·°F, based on three-year-aged solar reflectance and three-year-aged thermal emittance tested in accordance with CRRC-1 Standard
c. Increased roof insulation levels found in Table 5.5.3.1.1

Exceptions:
1. Ballasted roofs with a minimum stone ballast of 17 lb/ft^2 or 23 lb/ft^2 pavers
2. Vegetated roof systems that contain a minimum thickness of 2.5 in. of growing medium and covering a minimum of 75% of the roof area with durable plantings
3. Roofs where a minimum of 75% of the roof area
   a. is shaded during the peak sun angle on June 21 by permanent components or features of the building;
   b. is covered by offset photovoltaic arrays, building-integrated photovoltaic arrays, or solar air or water collectors; or
   c. is permitted to be interpolated using a combination of 1 and 2 above

4.~~d.~~ Steep-sloped roofs
5.~~e.~~ Low-sloped metal building roofs in Climate Zones 2 and 3
6.~~f.~~ Roofs over ventilated attics, roofs over semiheated spaces, or roofs over conditioned spaces that are not cooled spaces
7.~~g.~~ Asphaltic membranes in Climate Zones 2 and 3

The values for three-year-aged solar reflectance and three-year-aged thermal emittance shall be determined by a laboratory accredited by a nationally recognized accreditation organization and shall be labeled and certified by the manufacturer.

36** **5.5.4.2.3 Minimum Skylight Fenestration Area.** Change exception 2 to Section 5.5.4.2.3 as shown below.
(Note: Additions are shown in underline.)

2. Enclosed spaces where it is documented that existing structures or natural objects block direct beam sunlight on at least half of the roof over the enclosed space for more than 1500 daytime hours per year between 8 a.m. and 4 p.m.

37 **5.5.4.4.2 SGHC of Skylights.** Change exception 2 to Section 5.5.4.4.2 as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

2. For dynamic glazing, the minimum SHGC shall be used to demonstrate compliance with this section. Dynamic glazing shall be considered separately from other skylights ~~vertical fenestration~~, and area-weighted averaging with other skylights ~~vertical fenestration~~ that is not dynamic glazing shall not be permitted.

41 **6.1.1.3 Alterations to Heating, Ventilating, Air Conditioning, and Refrigeration in Existing Buildings.** Change the exceptions immediately following Section 6.1.1.3.5 to read "Exceptions to 6.1.1.3:" The exceptions apply to Section 6.1.1.3 rather than Section 6.1.1.3.5 alone.

41* **6.2.1 Compliance.** Revise Section 6.2.1 as shown below.
(Note: Additions are shown in underline.)

6.2.1 Compliance. Compliance with Section 6 shall be achieved by meeting all requirements for Sections 6.1, "General"; Section 6.7, "Submittals"; Section 6.8, "Minimum Equipment Efficiency Tables"; and one of the following:

a. Section 6.3, "Simplified Approach Option for HVAC Systems"
b. Sections 6.4, "Mandatory Provisions" and 6.5, "Prescriptive Path"
c. Sections 6.4, "Mandatory Provisions" and 6.6, "Alternative Compliance Path"

46 **6.4.3.4.3 Damper Leakage.** Revise Section 6.4.3.4.3 as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

6.4.3.4.3 Damper Leakage. Where outdoor air supply and exhaust/relief dampers are required by Section 6.4.3.4~~6.4.3.4.1~~, they shall have a maximum leakage rate as indicated in Table 6.4.3.4.3 when tested in accordance with AMCA Standard 500.

46 **6.4.3.8 Ventilation Controls for High-Occupancy Areas.** Delete "greater than" from the first sentence as shown below.

6.4.3.8 Ventilation Controls for High-Occupancy Areas. Demand control ventilation (DCV) is required for spaces larger than 500 ft^2 and with a design occupancy for ventilation of ~~greater than~~ ≥25 people per 1000 ft^2 of floor area and served by systems with one or more of the following:

48* **6.4.4.2.2 Duct Leakage Tests.** In the equation in Section 6.4.4.2.2 correct the C_L term as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

C_L = 4 ~~6~~, duct leakage class, cfm/100 ft^2 dust surface area at 1 in. wc

48 **6.4.4.2.2 Duct Leakage Tests.** Correct the equation in Section 6.4.4.2.2 as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

$$L_{max} = C_L P^{0.65}$$

where

L_{max} = maximum permitted leakage, cfm~~/~~ per 100 ft^2 of duct surface area

C_L = 4, duct leakage class, cfm~~/~~ per 100 ft^2 of duct surface area ~~at 1~~per in. of water$^{0.65}$

P = test pressure, which shall be equal to the design duct pressure class rating, in. of water

49 **6.5.1 Economizers.** In the first sentence change Section 6.5.1.6 to 6.5.1.5.

50-52 **6.5.1.3 Integrated Economizer Control and Table 6.5.1.4 DX Cooling Stage Requirements for Modulating Airflow Units.** Correct as shown below.

(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

6.5.1.3 Integrated Economizer Control. Economizer systems shall be integrated with the mechanical cooling system and be capable of providing partial cooling even when

…

a.

b.

~~**6.5.1.4**~~ c. Effective 1/1/2014, all other DX units, including those that control space temperature by modulating the airflow to the space, shall comply with the requirements of Table 6.5.1.3 ~~6.5.1.4.~~

6.5.1.5~~4~~4 Economizer Heating System Impact.

6.5.1.6~~5~~5 Economizer Humidification System Impact.

TABLE 6.5.1.3 ~~6.5.1.4~~ DX Cooling Stage Requirements for Modulating Airflow Units

60* **6.5.9 Hot Gas Bypass Limitation.** The last sentence in Section 6.5.9 of the first printing of 90.1-2013 was cut-off and the sentence is incomplete. The last sentence should read: "Hot gas bypass shall not be used on constant-volume units."

66 **Table 6.8.1-2 Electrically Operated Unitary and Applied Heat Pumps – Minimum Efficiency Requirements.** For equipment type Air Cooled (cooling mode) ≥240,000 Btu/h change "0.4 IEER" to "10.4 IEER" as shown below.

Air cooled (cooling mode)	≥240,000 Btu/h	All Other	Split System and Single Package	9.3 EER 9.4 IEER (before 1/1/2016) 10.4 ~~0.4~~ IEER (as of 1/1/2016)

69 **Table 6.8.1-3 Water-Chilling Packages – Efficiency Requirements.** See attached corrections to Table 6.8.1-3 (in red text).
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

74* **Table 6.8.1-9 Electrically Operated Variable-Refrigerant-Flow air Conditioners – Minimum Efficiency Requirements.** See attached corrections to Table 6.8.1-9 (in red text).
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

75 **Table 6.8.1-10 Electrically Operated Variable-Refrigerant-Flow Air-to-Air and Applied Heat Pumps—Minimum Efficiency Requirements.** See attached corrections to Table 6.8.1-10 (in red text).
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

76 **Table 6.8.1-10 Electrically Operated Variable-Refrigerant-Flow Air-to-Air and Applied Heat Pumps – Minimum Efficiency Requirements.** Delete "Air-to-Air" from the title of Table 6.8.1-10.

76 **Table 6.8.1-10 Electrically Operated Variable-Refrigerant-Flow Air-to-Air and Applied Heat Pumps – Minimum Efficiency Requirements.** For equipment type VRF air cooled (heating

mode) add "(cooling capacity)" below size category "≥65,000 Btu/h and <135,000 Btu/h" so it reads as shown below.

≥65,000 Btu/h and
<135,000 Btu/h
(cooling capacity)

83* **7.5.3 Buildings with High-Capacity Service Water Heating Systems.** In Exception 3 to Section 7.5.3 change "1,000,000 Btu/h" to "100,000 Btu/h".

84 **Table 7.8 Performance Requirements for Water-Heating Equipment.** See attached corrections to Table 7.8 (in red text).
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

91 **9.4.2 Exterior Building Lighting Power.** In the first sentence of Section 9.4.2 change "Table 9.4.2-1" to "Table 9.4.2-2".

94 **Table 9.5.1 Lighting Power Densities Using the Building Area Method.**
For building area type Dining: Bar lounge/leisure change the LPD value from "101 W/ft^2" to 1.01 W/ft^2".
For the building are type Fire station change the LPD value from "0.671 W/ft^2" to "0.67 W/ft^2".

99 **Table 9.6.1 Lighting Power Density Allowance Using the Space-by-Space Method and Minimum Control Requirements Using Either Method.** Delete the second occurrence of the Facility for the Visually Impaired space type in Table 9.6.1. See attached for corrections to Table 9.6.1 (in red text).
(Note: Deletions are shown in ~~strikethrough~~.)

112 **TABLE 11.5.1 Modeling Requirements for Calculating Design Energy Cost and Energy Cost Budget.** Revise Table 11.5.1 as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

Table 11.5.1 Modeling Requirements for Calculating Design Energy Cost and Energy Cost Budget

Proposed Design (Column A) Design Energy Cost (DEC)

1. **Design Model**

…

b. All conditioned spaces in the proposed design shall be simulated as being both heated and cooled, even if no cooling or heating system is being installed. Temperature and humidity control set points and schedules, as well as temperature control throttling range, shall be the same for *proposed* and ~~*baseline building designs*~~ *budget building designs*.

…

Table 11.5.1 Modeling Requirements for Calculating Design Energy Cost and Energy Cost Budget

Budget Building Design (Column B) Energy Cost Budget (ECB)

11. Service Water Heating

…
Exceptions
… c. For 24-hour facilities that meet the prescriptive criteria for use of condenser heat recovery systems described in Section 6.5.6.2, a system meeting the requirements of that section shall be included in the ~~*baseline building design*~~ *budget building design*, regardless of the exceptions to Section 6.5.6.2. If a condenser heat recovery system meeting the requirements described in Section 6.5.6.2 cannot be modeled, the requirement for including such a system in the actual building shall be met as a prescriptive requirement in accordance with Section 6.5.6.2 and no heat recovery system shall be included in the proposed design or budget building design.

117 **11.5.2 HVAC Systems.** Revise Section 11.5.2 as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

11.5.2 HVAC Systems

…

i.…Unmet load hours for the proposed design or ~~*baseline building designs*~~ *budget building design* shall not exceed 300. The unmet load hours for the proposed design shall not exceed the unmet load hours for the budget building design. Alternatively, unmet load hours exceeding approved by the building official, provided that sufficient justification is given indicating that the accuracy of the simulation is not significantly compromised by these unmet loads.

…

k. Kitchen Exhaust. For kitchens with a total exhaust hood airflow rate greater than 5000 cfm, use a demand ventilation system on 75% of the exhaust air. The system shall reduce exhaust and replacement air system airflow rates by 50% for one half of the kitchen occupied hours in the ~~baseline design~~ *budget building design*. If the proposed design uses demand ventilation, the same airflow rate schedule shall be used. The maximum exhaust flow rate allowed for the hood or hood section shall meet the requirements of Section 6.5.7.1.3 for the numbers and types of hoods and appliances provided in the proposed design.

159 **A9.4.5.1 Single Layer.** Replace Equation A9.4-2 as shown below.

$$Y = Y_o + (Y_m - Y_o)\left(\frac{X}{2}\right)\left(2 - \frac{X}{2}\right)$$

Correct equation:

$$Y = Y_o + (Y_m - Y_o)\left(\frac{X}{L}\right)\left(2 - \frac{X}{L}\right)$$

161 **A9.5.4.2 Double Layers.** Replace Equation A9.4-12 as shown below.

$$Y = Y_o + (Y_m - Y_o)\left(\frac{X}{2}\right)\left(2 - \frac{X}{2}\right)$$

Correct equation:

$$Y = Y_o + (Y_m - Y_o)\left(\frac{X}{L}\right)\left(2 - \frac{X}{L}\right)$$

161 **A9.4.5.1 Single Layer.** In Equation A9.4-10 of Section A9.4.5.1 change "Rct" to Rci".

162 **A9.5.4.2 Double Layers.** In Equation A9.4-20 of Section A9.4.5.2 change "Uofe" to "Uadj".

187 **Footnote 1 (bottom of page).** Change the URL for the schedules and internal loads as shown below.

1. Schedules and internal loads by building area type are located at http://sspc901.ashraepcs.org/documents.php.

255 **G3.1.1 Baseline HVAC System Type and Description.** Change the first sentence in Section G3.1.1 as shown below. The remained of Section G3.1.1 in unchanged.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

HVAC systems in the baseline building design shall be based on usage, number of floors, and conditioned floor area, and ~~heating source~~ climate zone as specified in Table G3.1.1-3 and shall conform with the system descriptions in Table G3.1.1-4.

259 **Table G3.1 Modeling Requirements for Calculating Proposed and Baseline Building Performance.**

6. Lighting. In the Proposed Building Performance column, item (g), change the reference from "Section 9.6.2(c)" to "Section 9.6.3" and change the reference from "Table 9.6.2" to "Table 9.6.3" in two places.

6. Lighting. In the Baseline Building Performance column, item (a), change the reference from "Section 9.6.2(c)" to "Section 9.6.3".

266* **G3.1.1.4 Modeling Building Envelope Infiltration.** Correct the I_{FLR} term in Section G3.1.1.4 as follows:
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

I_{FLR} = adjusted air leakage rate (expressed in cfm/ft^2) of the building envelope at a reference wind speed of 10 mph and the total gross floor area ~~above ground exterior wall area~~

267 **G3.1.2.1 Equipment Efficiencies.** Revise the second sentence in Section G3.1.2.1 as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

Chillers shall use Path A efficiencies as shown in Table 6.8.1-3. W~~w~~here efficiency ratings include supply fan energy, the efficiency rating shall be adjusted to remove the supply fan energy.

269 **G3.1.2.11 Exhaust Air Energy Recovery.** Change as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

G3.1.2.11 Exhaust Air Energy Recovery. Exhaust air energy recovery shall be modeled for the *baseline* ~~*budget*~~ *building design* in accordance with Section 6.5.6.1.

TABLE 6.8.1-3 Water Chilling Packages – Efficiency Requirements [a, b, e]

Equipment Type	Size Category	Units	Effective 1/1/2010		Effective 1/1/2015		Test Procedure [c]
			Path A	Path B	Path A	Path B	
Air-cooled chillers	< 150 Tons	EER (Btu/Wh)	≥9.562 FL	NA[d]	≥10.100 FL	≥9.700 FL	AHRI 550/590
			≥12.500 IPLV		≥13.700 IPLV	≥15.800 IPLV	
	≥150 Tons		≥9.562 FL	NA[d]	≥10.100 FL	≥9.700 FL	
			≥12.750 IPLV		≥14.000 IPLV	≥16.100 IPLV	
Air-cooled without condenser, electrically operated	All Capacities	EER(Btu/Wh)	Air-cooled chillers without condenser must be rated with matching condensers and comply with air-cooled chiller efficiency requirements				
Air-cooled absorption, single effect	All Capacities	COP (W/W)	≥0.600 FL	NA[d]	≥0.600 FL	NA[d]	AHRI 560
Water-cooled absorption, single effect	All Capacities	COP(W/W)	≥0.700 FL	NA[d]	≥0.700 FL	NA[d]	
Absorption double effect, indirect fired	All Capacities	COP(W/W)	≥1.000 FL	NA[d]	≥1.000 FL	NA[d]	
			≥1.050 IPLV		≥1.050 IPLV		
Absorption double effect, direct fired	All Capacities	COP(W/W)	≥1.000 FL	NA[d]	≥1.000 FL	NA[d]	

Table 6.8.1-9 Electrically Operated Variable-Refrigerant-Flow air Conditioners – Minimum Efficiency Requirements

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure
VRF air conditioners, air cooled	<65,000 Btu/h	All	VRF multisplit system	13.0 SEER	AHRI 1230
	≥65,000 Btu/h and <135,000 Btu/h	Electric resistance (or none)	VRF multisplit system	11.2 EER ~~12.5 IEER~~ 13.1 IEER	
	≥135,000 Btu/h and <240,000 Btu/h	Electric resistance (or none)	VRF multisplit system	11.0 EER ~~12.3 IEER~~ 12.9 IEER	
	≥240,000 Btu/h	Electric resistance (or none)	VRF multisplit system	10.0 EER ~~11.1 IEER~~ 11.6 IEER	

Table 6.8.1-10 Electrically Operated Variable-Refrigerant-Flow Air-to-Air and Applied Heat Pumps—Minimum Efficiency Requirements

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure
VRF air cooled (cooling mode)	<65,000 Btu/h	All	VRF multisplit system	13.0 SEER	AHRI 1230
	≥65,000 Btu/h and <135,000 Btu/h	Electric resistance (or none)	VRF multisplit system	11.0 EER ~~12.3~~ 12.9 IEER	
	≥65,000 Btu/h and <135,000 Btu/h	Electric resistance (or none)	VRF multisplit system with heat recovery	10.8 EER ~~12.1~~ 12.7 IEER	
	≥135,000 Btu/h and <240,000 Btu/h	Electric resistance (or none)	VRF multisplit system	10.6 EER ~~11.8~~ 12.3 IEER	
	≥135,000 Btu/h and <240,000 Btu/h	Electric resistance (or none)	VRF multisplit system with heat recovery	10.4 EER ~~11.6~~ 12.1 IEER	
	≥240,000 Btu/h	Electric resistance (or none)	VRF multisplit system	9.5 EER ~~10.6~~ 11.0 IEER	
	≥240,000 Btu/h	Electric resistance (or none)	VRF multisplit system with heat recovery	9.3 EER ~~10.4~~ 10.8 IEER	

TABLE 7.8 Performance Requirements for Water-Heating Equipment

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Performance Required[a]	Test Procedure[b,c]
Electric water heaters	≤12 kW	Resistance ≥20 gal	0.97–0.00132V EF	DOE 10 CFR Part 430
	>12 kW[e]	Resistance ≥20 gal	0.3 + 27/V_m %/h	Section G.2 of ANSI Z21.10.3
	≤24 Amps and ≤250 Volts	Heat Pump	0.93–0.00132V EF	DOE 10 CFR Part 430
Gas storage water heaters	≤75,000 Btu/h	≥20 gal	0.67–0.0019V EF	DOE 10 CFR Part 430
	>75,000 Btu/h[f]	<4000 (Btu/h)/gal	80% E_t (Q/~~799+16.6~~800 + 110 √V) SL, Btu/h	Section 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	0.62–0.0019V EF	DOE 10 CFR Part 430
	≥200,000 Btu/h[d,f]	≥4000 (Btu/h)/gal and <10 gal	80% E_t	Section G.1 and G.2 of ANSI Z21.10.3
	≥200,000 Btu/h[f]	≥4000 (Btu/h)/gal and ≥10 gal	80% E_t (Q/~~799+16.6~~800 + 110 √V) SL, Btu/h	
Oil storage water heaters	≤105,000 Btu/h	≥20 gal	0.59–0.0019V EF	DOE 10 CFR Part 430
	>105,000 Btu/h	<4000 (Btu/h)/gal	80% E_t (Q/~~799+16.6~~800 + 110 √V) SL, Btu/h	Section 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	0.59–0.0019V EF	DOE 10 CFR Part 430
	>210,000 Btu/h	≥4000 (Btu/h)/gal and <10 gal	80% E_t	Section 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/~~799+16.6~~800 + 110 √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	Section G.1 and G.2 of ANSI Z21.10.3
Hot-water supply boilers, gas[f]		≥4000 (Btu/h)/gal and ≥10 gal	80% E_t (Q/~~799+16.6~~800 + 110 √V) SL, Btu/h	
Hot-water supply boilers, oil		≥4000 (Btu/h)/gal and ≥10 gal	78% E_t (Q/~~799+16.6~~800 + 110 √V) SL, Btu/h	
Pool heaters, oil and gas	All		78% E_t	ASHRAE 146
Heat pump pool heaters	All		4.0 COP	~~AHRI 1160~~ ASHRAE 146
Unfired storage tanks	All		R-12.5	(none)

a. Energy factor (EF) and thermal efficiency (E_t) are minimum requirements, while standby loss (SL) is maximum Btu/h based on a 70°F temperature difference between stored water and ambient requirements. In the EF equation, V is the rated volume in gallons. 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
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 12kW 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.

Table 9.6.1 Lighting Power Density Allowance Using the Space-by-Space Method and Minimum Control Requirements Using Either Method *(Continued)*

Informative Note: **This table is divided into two sections; this first section covers space types that can be commonly found in multiple building types. The second part of this table covers space types that are typically found in a single building type.**			**The control functions below shall be implemented in accordance with the descriptions found in the referenced paragraphs within Section 9.4.1.1. For each space type: (1) All REQs shall be implemented. (2) At least one ADD1 (when present) shall be implemented. (3) At least one ADD2 (when present) shall be implemented.**								
			Local Control (See Section 9.4.1.1[a])	**Restricted to Manual ON (See Section 9.4.1.1[b])**	**Restricted to Partial Automatic ON (See Section 9.4.1.1[c])**	**Bilevel Lighting Control (See Section 9.4.1.1[d])**	**Automatic Daylight Responsive Controls for Sidelighting (See Section 9.4.1.1[e][6])**	**Automatic Daylight Responsive Controls for Toplighting (See Section 9.4.1.1[f][6])**	**Automatic Partial OFF (See Section 9.4.1.1[g] [Full Off complies])**	**Automatic Full OFF (See Section 9.4.1.1[h])**	**Scheduled Shutoff (See Section 9.4.1.1[i])**
Building Type Specific/Space Types[1]	**LPD W/ft²**	**RCR Threshold**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**
…											
Facility for the Visually Impaired[3]											
…in a chapel (used primarily by residents)	2.21	4	REQ	ADD1	ADD1	REQ	REQ	REQ	-	ADD2	ADD2
… in a recreation room/common living room (and not used primarily by staff)	2.41	6	REQ	ADD1	ADD1	REQ	REQ	REQ	-	ADD2	ADD2
…											
~~**Facility for the Visually Impaired [3]**~~											
~~… in a recreation room/common living room (and not used primarily by staff)~~	~~2.41~~	~~6~~	-	-	-	-	-	-	-	-	-
…											

1. In cases where both a common space type and a building area specific space type are listed, the building area specific space type shall apply
2. In corridors, the extra lighting power density allowance is permitted when the width of the corridor is less than 8 ft and is not based on the RCR.
3. A "Facility for the Visually Impaired" is a facility that can be documented as being designed to comply with the light levels in ANSI/IES RP-28 and is licensed or will be licensed by local/state authorities for either senior long-term care, adult daycare, senior support and/or people with special visual needs.
4. For accent lighting, see Section 9.6.2(b).
5. Sometimes referred to as a "Picking Area."
6. Automatic daylight responsive controls are mandatory only if the requirements of the specified sections are present.
7. An additional 0.53 w/ft² shall be allowed, provided that the additional lighting is controlled separately from the base allowance of 0.42 W/ft². The additional 0.53 w/ft² allowance shall not be used for any other purpose.