

**ERRATA SHEET FOR  
ANSI/ASHRAE/IES STANDARD 90.1-2016 (SI Edition)  
Energy Standard for Buildings Except Low-Rise Residential Buildings**

**February 8, 2024**

The corrections listed in this errata sheet apply to ANSI/ASHRAE/IES Standard 90.1-2016, SI Edition. The first printing is identified on the outside back cover of the standard as “Product code: 86276 10/16”. Shaded items have been added since the previously published errata sheet dated June 15, 2023 was distributed.

**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>.

<u>Page(s)</u>	<u>Erratum</u>
10	<p><b>Footnote 1 (bottom of page).</b> Change the URL for the schedules and internal loads as shown below.</p> <p>1. Schedules and internal loads by <i>building</i> area type are at <a href="http://sspc901.ashraeps.org/documents.php">http://sspc901.ashraeps.org/documents.php</a>.</p>
37	<p><b>3.3 Abbreviations and Acronyms.</b> Change IES from “Illumination Engineering Society of North America” to “Illuminating Engineering Society”.</p>
53	<p><b>Table 5.5-2 Building Envelope Requirements for Climate Zone 2 (A, B)*.</b> In Table 5.5-2, in the row for Floors, Mass, in the column Nonresidential, Insulation Min. R-Value, change “R-1.9” to “R-1.1”.</p>
70	<p><b>5.9.1 Inspections.</b> Insert the following informative note immediately after Section 5.9.1. (Note: Additions are shown in <u>underline</u>.)</p> <p><b><u>Informative Note:</u></b> See Appendix E for commissioning references.</p>
80	<p><b>6.4.3.4.3 Damper Leakage.</b> Revise Section 6.4.3.4.3 as shown below. (Note: Additions are shown in <u>underline</u> and deletions are shown in <del>strikethrough</del>.)</p> <p><b>6.4.3.4.3 Damper Leakage</b> Where <i>outdoor air</i> supply and exhaust/relief dampers are required by Section <del>6.4.3.4.3.4.1</del>, they shall have a maximum leakage rate as indicated in Table 6.4.3.4.3 when tested in accordance with AMCA 500D.</p>
85	<p><b>6.4.4.2.2 Duct Leakage Tests.</b> Correct the equation in Section 6.4.4.2.2 as shown below. (Note: Additions are shown in <u>underline</u> and deletions are shown in <del>strikethrough</del>.)</p>

$$L_{max} = C_L(P^{0.65}/1000)$$

where

- $L_{max}$  = maximum permitted leakage, L/s per m<sup>2</sup> of duct surface area
- $C_L$  = ~~40.00563~~, duct leakage class, L/s per m<sup>2</sup> of duct surface area at 250 per Pa<sup>0.65</sup>
- $P$  = test pressure, which shall be equal to the design duct pressure class rating, Pa

- 97 **6.5.3.6 Fractional Kilowatt Fan Motors.** Revise item 3 of the Exceptions to 6.5.3.6 as shown below.  
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

**Exceptions to 6.5.3.6**

...

3. Motors covered by Table 10.8-3 or Table 10.8-4 ~~Table 10.8-4 or Table 10.8-5~~.

- 99 **6.5.4.4 Chilled- and Hot-Water Temperature Reset Controls.** In the Exceptions to 6.5.4.4, Exception 3, change the reference to “Section 6.5.4.1” to “Section 6.5.4.2”.

- 100 **TABLE 6.5.4.6 Piping System Design Maximum Flow Rate in L/s.** Change “1” L/s to “11” L/s for Nominal Pipe Size 90 mm in column 2 (≤2000 Hours/Yr, Other).

- 103 **Table 6.5.6.1-2 Exhaust Air Energy Recovery Requirements for Ventilation Systems Operating Greater than or Equal to 8000 Hours per Year.** Change “≥35” to “≥66” in Table 6.5.6.1-2 as shown below.  
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

**Table 6.5.6.1-2 Exhaust Air Energy Recovery Requirements for Ventilation Systems Operating Greater than or Equal to 8000 Hours per Year**

Climate Zone	% Outdoor Air at Full Design Airflow Rate							
	≥10% and <20%	≥20% and <30%	≥30% and <40%	≥40% and <50%	≥50% and <60%	≥60% and <70%	≥70% and <80%	≥80%
	Design Supply Fan Airflow Rate, L/s							
3C	NR	NR	NR	NR	NR	NR	NR	NR
0B, 1B, 2B, 3B, 4C, 5C	NR	≥9203	≥4248	≥2360	≥1888	≥1416	≥708	≥60
0A, 1A, 2A, 3A, 4B, 5B	≥1180	≥944	≥472	≥236	<u>≥66</u> <del>35</del>	≥60	≥50	≥40
4A, 5A, 6A, 6B, 7, 8	≥100	≥65	≥50	≥40	≥35	≥30	≥25	≥20

NR—Not required

- 115 **TABLE 6.8.1-4 Electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, Single-Package Vertical Heat Pumps, Room Air Conditioners, and Room Air-Conditioner Heat Pumps – Minimum Efficiency Requirements.** Remove “/1000” from the efficiency equations in Table 6.8.1-4 as shown below.  
(Note: Deletions are shown in ~~strikethrough~~.)

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure <sup>a</sup>
PTAC (cooling mode) standard size	All capacities	35.0°Cdb outdoor air	4.04 – (0.300 × Cap <sup>1000</sup> ) <sup>c</sup> COP <sub>c</sub> (before 1/1/2015) 4.10 – (0.300 × Cap <sup>1000</sup> ) <sup>c</sup> COP <sub>c</sub> (as of 1/1/2015)	AHRI 310/380
PTAC (cooling mode) nonstandard size <sup>b</sup>	All capacities	35.0°Cdb outdoor air	3.19 – (0.213 × Cap <sup>1000</sup> ) <sup>c</sup> COP <sub>c</sub>	AHRI 310/380
PTHP (cooling mode) standard size	All capacities	35.0°Cdb outdoor air	4.10 – (0.300 × Cap <sup>1000</sup> ) <sup>c</sup> COP <sub>c</sub>	AHRI 310/380
PTHP (cooling mode) nonstandard size <sup>b</sup>	All capacities	35.0°Cdb outdoor air	3.16 – (0.213 × Cap <sup>1000</sup> ) <sup>c</sup> COP <sub>c</sub>	AHRI 310/380
PTHP (heating mode) standard size	All capacities		3.7 – (0.052 × Cap <sup>1000</sup> ) <sup>c</sup> COP <sub>H</sub>	AHRI 310/380
PTHP (heating mode) nonstandard size <sup>b</sup>	All capacities		2.9 – (0.026 × Cap <sup>1000</sup> ) <sup>c</sup> COP <sub>H</sub>	AHRI 310/380

**120 Table 6.8.1-10 Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps – Minimum Efficiency Requirements (Continued).** Revise the equipment type subcategory for “VRF groundwater source (cooling mode)” as shown in the attached Table 6.8.1-10.  
(Note: Deletions are shown in ~~strikethrough~~.)

**127 Table 6.8.3-1 Minimum Piping Insulation Thickness Heating and Hot Water Systems<sup>a,b,c,d,e</sup> (Steam, Steam Condensate, Hot-Water Heating and Domestic Water Systems).** Revise Note e of Table 6.8.3-1 as shown below.  
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

e. The table is based on steel pipe. Nonmetallic pipes schedule 80 thickness or less shall use the table values. For other nonmetallic pipes having *thermal resistance* greater than that of steel pipe, reduced insulation thicknesses are permitted if documentation is provided showing that the pipe with the proposed insulation has no more heat transfer per metre foot than a steel pipe of the same size with the insulation thickness shown in the table.

**128 Table 6.8.3-2 Minimum Piping Insulation Thickness Cooling Systems (Chilled Water, Brine, and Refrigerant).** Change the insulation thickness requirement from “15 mm” to “13 mm” in three places.

**143 Exception to 9.4.1.1(g).** Revise the Exception to 9.4.1.1(g) as shown below.  
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

**Exception to 9.4.1.1(g)**

This requirement does not have to be complied with in *spaces* that meet all four ~~three~~ of the following requirements:

1. The *space* has an installed *LPD* of no more than 0.80 W/ft<sup>2</sup>.
2. The *space* is lighted by *HID lamp*.
3. The *general lighting* power in the *space* is automatically reduced by at least 30% within 20 minutes of all occupants leaving the *space*.
4. Lighting load does not exceed 0.02 W/ft<sup>2</sup> multiplied by the *gross lighted area* of the *building*.

**144 94.1.1 Interior Lighting Controls.** Add the following exception to the Exceptions to 9.4.1.1(h) as

shown below.

4. Lighting load not exceeding  $0.22 \text{ W/m}^2$  multiplied by the *gross lighted area* of the *building*.

- 147 **Table 9.4.2-2 Individual Lighting Power Allowance for *Building* Exteriors.** For Nontradable Surfaces, *Building* facades, change “66 W/lin m of facade length” to “8.2 W/lin m of facade length”.
- 151 **Table 9.5.1 Lighting Power Density Allowances Using the *Building* Area Method.** Add the *LPD* value for Workshop as “9.7”  $\text{W/m}^2$ .
- 183 **12. Normative References.** In Section 12 make the following correction.  
(Note: Deletions are shown in ~~strikethrough~~.)  
  
AHRI 340/360-2015 (~~I-P~~) and AHRI 344/364-2015 (~~SI~~) Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment
- 205 **Table A3.1-3 Assembly *U-Factors*, *C-Factors*, *Ru*, *Rc*, and *HC* for Concrete Block Walls (Continued).** In Table A3.1-3 for 200 mm block, Density  $1,680 \text{ kg/m}^3$ , Partly Grouted, Cells Empty, change *HC* from “0.8” to “208”.
- 249 **Footnote 2 (bottom of page).** Change the URL for the schedules and internal loads as shown below.  
  
2. Schedules and internal loads by *building* area type are found at <http://sspc901.ashraepcs.org/documents.php>.
- 257 **Informative Appendix E Informative References.** In the table in Informative Appendix E make the following corrections. See attached.  
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)
- 282 **G3.1.3.11 Heat Rejection (Systems 7, 8, 9, 12, and 13).** In Section G3.1.3.11 replace “water-side economizer” with “fluid economizer” in two places.
- 285 **Table G3.1.1.-3 Baseline *HVACV* System Types.** In the first column of Table G3.1.1-3 change “residential” to “nonresidential” in three places.
- 311 **Table H-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2013 (Continued).** For Addendum ad in Table H-1 change “unlabeled” to “unlabeled”.
- 376 **Section Annex1-1: ASHRAE Standard 169-2013, Section A3: Climate Zone Definitions.** In Section A3, sentence immediately following item b.3 delete the extra “the” from the first word “Userthe” so the sentence reads “Use the third criteria below for determining the Dry/Humid threshold if not Marine (C)”.

**Table 6.8.1-10 Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps— Minimum Efficiency Requirements (Continued)**

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure
VRF groundwater source (cooling mode)	<40 kW	All	VRF multisplit system with heat recovery 15°C entering water	4.75 COP <sub>C</sub>	AHRI 1230
			VRF multisplit system with heat recovery 15°C entering water	4.69 COP <sub>C</sub>	
	VRF multisplit system with heat recovery 15°C entering water		4.04 COP <sub>C</sub>		
	VRF multisplit system with heat recovery 15°C entering water		3.99 COP <sub>C</sub>		
	≥40 kW				

**Informative Appendix E  
Informative References**

Subsection No.	Reference	Title/Source
<u>5.9.1</u>	<u>ASTM E2947-14</u>	<u>Standard Guide for Building Enclosure Commissioning</u>
<u>5.9.1</u>	<u>ASTM E2813-12</u>	<u>Standard Practice for Building Enclosure Commissioning</u>
<u>6.7.2.3-6.7.2.4</u>	NEBB Procedural Standards—2013	Procedural Standards for Building Systems Commissioning
<u>6.7.2.3.1</u>	AABC 2002	Associated Air Balance Council, National Standards for Total System Balance
<u>6.7.2.3.1</u>	ASHRAE Standard 111-2008	Measurement, Testing, Adjusting and Balancing of Building HVAC Systems
<u>6.7.2.4</u>	<u>ASHRAE Standard 202-2013</u>	<u>Commissioning Process for Buildings and Systems</u>
<u>6.7.2.4</u>	<u>ASHRAE Guideline 0-2013</u>	<u>The Commissioning Process</u>

**Table G3.1.1-3 Baseline HVAC System Types**

<b>Building Type, Number of Floors, and Gross Conditioned Floor Area</b>	<b>Climate Zones 3B, 3C, and 4 to 8</b>	<b>Climate Zones 0 to 3A</b>
Residential	<i>System 1—PTAC</i>	<i>System 2—PTHP</i>
Public assembly <11,000 m <sup>2</sup>	<i>System 3—PSZ-AC</i>	<i>System 4—PSZ-HP</i>
Public assembly ≥11,000 m <sup>2</sup>	<i>System 12—SZ-CV-HW</i>	<i>System 13—SZ-CV-ER</i>
Heated-only storage	<i>System 9—Heating and ventilation</i>	<i>System 10—Heating and ventilation</i>
Retail and 2 floors or fewer	<i>System 3—PSZ-AC</i>	<i>System 4—PSZ-HP</i>
Other <b>nonresidential</b> and 3 floors or fewer and <2300 m <sup>2</sup>	<i>System 3—PSZ-AC</i>	<i>System 4—PSZ-HP</i>
Other <b>nonresidential</b> and 4 or 5 floors and <2300 m <sup>2</sup> or 5 floors or fewer and 2300 m <sup>2</sup> to 14,000 m <sup>2</sup>	<i>System 5—Packaged VAV with reheat</i>	<i>System 6—Packaged VAV with PFP boxes</i>
Other <b>nonresidential</b> and more than 5 floors or >14,000 m <sup>2</sup>	<i>System 7—VAV with reheat</i>	<i>System 8—VAV with PFP boxes</i>