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

March 17, 2025

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 February 8, 2025 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.

Page(s)	Erratum
10	**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 at http://sspc901.ashraepcs.org/documents.php.
37	**3.3 Abbreviations and Acronyms.** Change IES from "Illumination Engineering Society of North America" to "Illuminating Engineering Society".
53	**Table 5.5-2 *Building Envelope* Requirements for Climate Zone 2 (A, 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".
70	**5.9.1 Inspections.** Insert the following informative note immediately after Section 5.9.1. *(Note: Additions are shown in underline.)* ***Informative Note:*** See Appendix E for commissioning references.
80	**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 500D.
85	**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~~.)*

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

where

L_{max} = maximum permitted leakage, L/s·per m^2 of duct surface area

C_L = ~~4~~0.00563, duct leakage class, L/s·per m^2 of duct surface area ~~at 250~~per $Pa^{0.65}$

P = test pressure, which shall be equal to the design duct pressure class rating, Pa

89 **Table 6.5.1.1.3 High-Limit Shutoff Control Settings for Air Economizers.** Revise Table 6.5.1.1.3 as shown in the attached.

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

	% *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%
Climate Zone	**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	≥66~~35~~	≥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[a]**
PTAC (cooling mode) standard size	All capacities	35.0°Cdb *outdoor air*	4.04 – (0.300 × Cap~~/1000~~)[c] COP_C (before 1/1/2015) 4.10 – (0.300 × Cap~~/1000~~)[c] COP_C (as of 1/1/2015)	AHRI 310/380
PTAC (cooling mode) nonstandard size[b]	All capacities	35.0°Cdb *outdoor air*	3.19 – (0.213 × Cap~~/1000~~)[c] COPc	AHRI 310/380
PTHP (cooling mode) standard size	All capacities	35.0°Cdb *outdoor air*	4.10 – (0.300 × Cap~~/1000~~)[c] COP_c	AHRI 310/380
PTHP (cooling mode) nonstandard size[b]	All capacities	35.0°Cdb *outdoor air*	3.16 – (0.213 × Cap~~/1000~~)[c] COPc	AHRI 310/380
PTHP (heating mode) standard size	All capacities		3.7 – (0.052 × Cap~~/1000~~)[c] COP_H	AHRI 310/380
PTHP (heating mode) nonstandard size[b]	All capacities		2.9 – (0.026 × Cap~~/1000~~)[c] COP_H	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[a,b,c,d,e] (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^2.
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^2 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 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" 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 341/361-2015 (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 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 "unlabled" 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 6.5.1.1.3 High-Limit Shutoff *Control* Settings for *Air Economizers*[b]

Control Type	Allowed Only in Climate Zone at Listed *Set Point*	Required High-Limit *Set Points* (Economizer Off when):	
		Equation	Description
Fixed dry-bulb temperature	0B, 1B, 2B, 3B, 3C, 4B, 4C, 5B, 5C, 6B, 7, 8	T_{OA} > 24°C	*Outdoor air* temperature exceeds 24°C
	5A, 6A	T_{OA} > 21°C	*Outdoor air* temperature exceeds 21°C
	0A, 1A, 2A, 3A, 4A,	T_{OA} > 18°C	*Outdoor air* temperature exceeds 18°C
Differential dry-bulb temperature	0B, 1B, 2B, 3B, 3C, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	$T_{OA} > T_{RA}$	*Outdoor air* temperature exceeds return air temperature
Fixed enthalpy with *fixed* dry-bulb temperature	All	h_{OA} > 65.1 ~~47~~ kJ/kg[a] or T_{OA} > 24°C	*Outdoor air* enthalpy exceeds 65.1 ~~47~~ kJ/kg[a] of dry air[a] or *outdoor air* temperature exceeds 24°C
Differential enthalpy with *fixed* dry-bulb temperature	All	$h_{OA} > h_{RA}$ or T_{OA} > 24°C	*Outdoor air* enthalpy exceeds return air enthalpy or *outdoor air* temperature exceeds 24°C

a. At altitudes substantially different than sea level, the *fixed* enthalpy limit shall be set to the enthalpy value at 24°C and 50% rh. As an example, at approximately 1830 m elevation, the *fixed* enthalpy limit is approximately 71.4 ~~53.5~~ kJ/kg.

b. Devices with selectable rather than adjustable *set points* shall be capable of being set to within 1.1°C and 3.4kJ/kg of the *set point* listed.

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_C	AHRI 1230
			VRF multisplit *system* with heat recovery 15°C entering water	4.69 COP_C	
	≥40 *kW*		*VRF* multisplit *system* ~~with heat recovery~~ 15°C entering water	4.04 COP_C	
			VRF multisplit *system* with heat recovery 15°C entering water	3.99 COP_C	

Informative Appendix E
Informative References

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

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

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