ADDENDA

ANSI/ASHRAE/IES Addendum bs to
ANSI/ASHRAE/IES Standard 90.1-2022

Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings

Approved by ASHRAE and the American National Standards Institute on November 28, 2025, and by the Illuminating Engineering Society on November 13, 2025.

This addendum was approved by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. Instructions for how to submit a change can be found on the ASHRAE® website (https://www.ashrae.org/continuous-maintenance).

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 ISSN 1041-2336

Approved American National Standard
www.ansi.org

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FOREWORD

Addendum bs adds minimum efficiency improvements for certain products in Tables 6.8.1-4, specifically single-package vertical air conditioners (SPVAC) and single-package vertical heat pumps (SPVHP).

The current industry test procedure is AHRI 390-2021 (I-P), Performance Rating of Single Package Vertical Air-Conditioners (SPVAC) and Heat Pumps (SPVHP) (*www.ahrinet.org/system/files/2023-06/ANSI%20AHRI%20390-2021%20I-P.pdf).*

The AHRI 390 standard includes requirements for publishing the full-load cooling efficiency EER metric and the annualized IEER metric. For heat-pump heating, the standard requires a COP_H at 47°F be published, but there is no requirement for other COP_H at 17°F and 5°F data to be published, and no annualized metric is defined in the standard. The revised standard was adopted in Standard 90.1-2022, but no minimum values were defined for IEER, and only the full-load EER and COP_H at 47°F were included in Table 6.8.1-4.

DOE adopted AHRI 390-2021 on December 7, 2022 (87FR75144). In the DOE test procedure final rule, DOE amended the federal test procedure for SPVAC and SPVHP to incorporate by reference AHRI 390–2021. DOE established a new Appendix G to document the test procedure for SPVAC and SPVHP. DOE also changed their cooling metric from EER to IEER. DOE Appendix G1 provides the test procedure for representations based on IEER and will be federally mandatory only at such time as compliance is required with amended energy conservation standards.

On December 8, 2022 (87FR75388), DOE issued a proposed rule to adopt standards based on IEER and COP_H that are of equivalent stringency as the current DOE energy conservation standard levels and the current standard levels specified in ASHRAE Standard 90.1-2019, shown below (DOE Table I-1). DOE proposed that, if adopted, energy conservation standards would apply to SPVAC and SPVHP manufactured in, or imported into, the United States starting on the tentative compliance date of 360 days after the publication in the Federal Register of the final rule for this rulemaking. DOE has proposed to adopt the values from Table I-1 (below), which shows the cross-walked IEER and COPH levels with no increases, as their economic analysis could not justify increases.

Table I-1—Proposed Energy Conservation Standards for SPVUs

Equipment class	Proposed standard level
SPVAC <65,000 Btu/h	IEER = 12.5
SPVHP <65,000 Btu/h	IEER = 12.5 COP = 3.3
SPVAC ≥65,000 Btu/h and <135,000 Btu/h	IEER = 10.3
SPVHP ≥65,000 Btu/h and <135,000 Btu/h	IEER = 10.3 COP = 3.0
SPVAC ≥135,000 Btu/h and <240,000 Btu/h	IEER = 11.2
SPVHP ≥135,000 Btu/h and <240,000 Btu/h	IEER = 11.2 COP = 3.0

AHRI and manufacturers have done additional work and have proposed for Standard 90.1 a two-step increase in the proposal for IEER and COP_H levels. This addendum updates the metrics for SPVAC and SPVHP used in Table 6.8.1-4 to add IEER and the minimum values for the metrics, including future efficiency improvements.

AHRI proposed the following changes to Standard 90.1 Table 6.8.1-4:

a. *For cooling—IEER and EER will be used for cooling mode for both SPVAC and SPVHP. DOE is only allowed to regulate one metric and has changed from EER to IEER, but ASHRAE Standard 90.1 will continue to regulate both EER and IEER due to concerns in warm climate zones, and minimum requirements for both will be included in Standard 90.1*
b. *For heating—COP_H at 47°F for heating mode of heat pumps will continue to be used, and no other metrics will be added for COP_H at 17°F or 5°F, and no annualized metric will be used because AHRI 390 has not defined an annualized heating metric.*

For the next edition of ASHRAE Standard 90.1, changes in the following three steps will be made to minimum values for the cooling efficiency metrics and heating metrics:

Step 1: The proposed standard level is cross walked from today's EER to IEER to add the annualized IEER metric based on current products with no product redesign. The cross-walked IEER minimums will be added to the 2025 edition of Standard 90.1, effective on the date of publication. The current EER levels will remain in the standard. The minimum cooling values will be the same for SPVAC and SPVHP. The current COP_H levels range from 3.0 to 3.3, and AHRI proposes that all sizes be 3.3 because all products can currently comply with that.

Step 2: On January 1, 2028, the cooling efficiency IEER levels are proposed to increase by approximately 10% of the cross-walked 2025 values. EER levels will be held constant to provide a backstop for high ambient and peak load concerns. The minimum cooling values will be the same for SPVAC and SPVHP. The COP_H 47°F values will increase to 3.4 for all size units.

Step 3: On January 1, 2031, the IEER efficiency levels are proposed to increase again by approximately 20% of the 2025 values. EERs will continue to be used but will remain at the 2025 levels as a backstop for peak load and warm climates. The minimum cooling values will be the same for SPVAC and SPVHP. The COP_H 47°F values will increase to 3.5 for all size units.

For the 2025 revision of ASHRAE Standard 90.1, the following will be used:

a. The table will continue to use COP_H even though the AHRI 390 standard only uses COP. This is to differentiate between cooling and heating with the use of COP_C for cooling efficiency and COP_H for heating efficiency in ASHRAE Standard 90.1 (SI). There is no AHRI 390 SI standard at this time, so the confusion was not addressed by AHRI.

b. No new metric changes will be made, and only the current full-load COP_H at 47°F will be listed in the Standard 90.1.

c. The heating COP_H at 47°F will increase from 3.0 to 3.3 for the >65000 Btu/h products, which is not per the DOE rule. Review of the AHRI directory indicated that all products are currently above 3.3, and AHRI recommended this change. AHRI also proposed the SPVAC products will then have one common $COPH_{47}$ for all capacity categories.

d. On January 1, 2028, the heating COP_H at 47°F will further be increased 3% relative to 2025 to a value 3.4 for all SPVHP products.

e. On January 1, 2031, the COP_H at 47°F will again be increased 3% relative to 2025 to a value 3.5 for all SPVHP.

AHRI has provided estimated product cost increases for the changes in 2028 and 2031. Using the Standard 90.1 work and the energy cost-savings estimate using the Standard 90.1 primary school reference building, an economic analysis has been completed and is summarized below. A primary school was used because the SPVAC and SPVHP are often used in schools. Other buildings will have similar energy saving scalars.

For the economic analysis, a U.S. average electric cost of 0.1122 $/kW was used as well as the Standard 90.1 energy cost adjusted for the social cost of carbon with a modified electric rate 0.1772 $/kW. The scalar ratio, which is equivalent to a payback period, was then calculated and compared to the scalar ratio limit. Typically, these products use a life of 15 years, but some have used 18 and 20 hours, and the table below shows the scalar limit for all three. The scalar analysis was done for all 19 climate zones and for cooling and heat pumps and then weight averaged using regional sales volumes.

	Energy Cost Scalar		***Energy Cost + Cost of Carbon Scalar***	
15 yr. Cooling Scalar Limit = 11.4, Heating Scalar Limit =11.5 *18 yr. Cooling Scalar Limit = 13.3, Heating Scalar Limit =13.1* *20 hr. Cooling Scalar Limit = 14.4, Heating Scalar Limit =14.1*				
Product	***2028***	***2031***	***2028***	***2031***
SPVAC<65K Btu/h	*16.33*	*12.01*	*10.34*	*7.60*
SPVAC>65K and <135K Btu/h	*24.63*	*16.67*	*15.59*	*10.55*
SPVAC >135K Btu/h	*25.92*	*17.54*	*16.41*	*11.11*
SPVHP<65K Btu/h	*14.73*	*11.18*	*9.32*	*7.08*
SPVHP>65K and <135K Btu/h	*21.55*	*16.02*	*13.64*	*10.14*
SPVHP >135K Btu/h	*22.67*	*16.85*	*14.36*	*10.67*
Weighted Average	*20.02*	*14.29*	*12.68*	*9.05*

The scalar results associated with 2028 efficiency levels exceed the Standard 90.1 scalar limits for some products. They are better with the cost of carbon. The SSPC 90.1 Mechanical Subcommittee has reviewed the data provide by AHRI, and, relative to other cost estimate provided by AHRI for unitary products and for WSHP, the estimates are the highest we have seen. The costs are likely high for the 2028 efficiency levels, as some of the changes may include redesign to use multiple stages and enhanced fan control. The incremental costs in 2031 are lower, and the cost effectiveness is better in 2031. Overall, the MSC feels the cost increases are very conservative, and once the manufacturers have had more time to optimize designs, the incremental cost will likely be lower. Manufacturers, overall, are in support of the changes proposed here despite some equipment appearing as marginally cost-effective.

Informative Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum bs to Standard 90.1-2022

Revise Table 6.8.1-4 as shown to modify SPVAC and SPVHP requirements (I-P and SI). Note that Addendum bq modifies window air conditioner requirements, which have been moved to a new Table 6.8.1-22. Note, only the modified requirements for SPVAC are show.

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 (I-P)

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency[d]	Test Procedure[a]
[. . .]				
SPVAC (cooling mode) single and three phase	<65,000 Btu/h	~~95°F db/75°F wb outdoor air~~[e]	11.0 *EER*, 12.5 *IEER* before 1/1/2028 11.0 EER, 13.7 *IEER* on or after 1/1/2028 11.0 EER, 15.0 *IEER* on or after 1/1/2031	AHRI 390
	≥65,000 Btu/h and <135,000 Btu/h		10.0 *EER*, 11.2 *IEER* before 1/1/2028 10.0 *EER*, 12.3 *IEER* on or after 1/1/2028 10.0 *EER*, 13.4 *IEER* on or before 1/1/2031	
	≥135,000 Btu/h ~~and <240,000 Btu/h~~		10.0 *EER*, 11.2 *IEER* before 1/1/2028 10.0 *EER*, 12.3 *IEER* on or after 1/1/2028 10.0 *EER*, 13.4 *IEER* on or before 1/1/2031	
SPVHP (cooling mode)	<65,000 Btu/h	~~95°F db/75°F wb outdoor air~~[e]	11.0 *EER*, 12.5 *IEER* before 1/1/2028 11.0 *EER*, 13.7 *IEER* on or after 1/1/2028 11.0 *EER*, 15.0 *IEER* on or after 1/1/2031	AHRI 390
	≥65,000 Btu/h and <135,000 Btu/h		10.0 *EER*, 11.2 *IEER* before 1/1/2028 10.0 *EER*, 12.3 *IEER* on or after 1/1/2028 10.0 *EER*, 13.4 *IEER* on or after 1/1/2031	
	≥135,000 Btu/h ~~and <240,000 Btu/h~~		10.0 *EER*, 11.2 *IEER* before 1/1/2028 10.0 *EER*, 12.3 *IEER* on or before 1/1/2028 10.0 *EER*, 13.4 *IEER* on or before 1/1/2031	

a. Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

b. Nonstandard size units must be factory *labeled* as follows: "MANUFACTURED FOR NONSTANDARD SIZE APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEW STANDARD PROJECTS." Nonstandard size efficiencies apply only to units being installed in existing sleeves having an external *wall* opening of less than 16 in. high or less than 42 in. wide and having a cross-sectional area less than 670 in^2.

c. The cooling-mode wet-bulb temperature requirement only applies for units that reject condensate to the condenser coil.

~~d. *Room air conditioners* are regulated as consumer products by 10 CFR 430. For U.S. applications of *room air conditioners*, refer to Informative Appendix F, Table F-3, for the U.S. DOE minimum efficiency requirements for U.S. applications.~~

~~e~~d."Cap" in *EER* and COP_H equations for *PTAC*s and *PTHP*s means cooling capacity in Btu/h at 95°F outdoor dry-bulb temperature.

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 (I-P) *(Continued)*

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency[d]	Test Procedure[a]
SPVHP (heating mode)	<65,000 Btu/h	47°F db/43°F wb *outdoor air*	3.3 COP_H before 1/1/2028 3.4 COP_H on or after 1/1/2028 3.5 COP_H on or after 1/1/2031	AHRI 390
	≥65,000 Btu/h and <135,000 Btu/h		~~3.0 COP_H~~ 3.3 COP_H before 1/1/2028 3.4 COP_H on or after 1/1/2028 3.5 COP_H on or after 1/1/2031	
	≥135,000 Btu/h ~~and <240,000 Btu/h~~		~~3.0 COP_H~~ 3.3 COP_H before 1/1/2028 3.4 COP_H on or after 1/1/2028 3.5 COP_H on or after 1/1/2031	

[. . .]

a. Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
b. Nonstandard size units must be factory *labeled* as follows: "MANUFACTURED FOR NONSTANDARD SIZE APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEW STANDARD PROJECTS." Nonstandard size efficiencies apply only to units being installed in existing sleeves having an external *wall* opening of less than 16 in. high or less than 42 in. wide and having a cross-sectional area less than 670 in^2.
c. The cooling-mode wet-bulb temperature requirement only applies for units that reject condensate to the condenser coil.
~~d. *Room air conditioners* are regulated as consumer products by 10 CFR 430. For U.S. applications of *room air conditioners*, refer to Informative Appendix F, Table F-3, for the U.S. DOE minimum efficiency requirements for U.S. applications.~~
~~e~~d."Cap" in *EER* and COP_H equations for *PTAC*s and *PTHP*s means cooling capacity in Btu/h at 95°F outdoor dry-bulb temperature.

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 (SI)

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency[d]	Test Procedure[a]
SPVAC (cooling mode) single and three phase	<19 kW	~~35°C db/23.9°C *outdoor air*[c]~~	3.22 COP_C, 3.66 *ICOP* before 1/1/2028 3.22 COP_C, 4.01 *ICOP* on or after 1/1/2028 3.22 COP_C, 4.01 *ICOP* on or after 1/1/2031	AHRI 390
	≥19 kW and <39 kW		2.93 COP_C, 3.28 *ICOP* before 1/1/2028 2.93 COP_C, 3.60 *ICOP* on or after 1/1/2028 2.93 COP_C, 3.93 *ICOP* on or after 1/1/2031	
	≥39 kW ~~and <700 kW~~		2.93 COP_C, 3.28 *ICOP* before 1/1/2028 2.93 COP_C, 3.60 *ICOP* on or after 1/1/2028 2.93 COP_C, 3.93 *ICOP* on or after 1/1/2031	
SPVHP (cooling mode)	<19 kW	~~35°C db/23.9°C *outdoor air*[c]~~	3.22 COP_C, 3.66 *ICOP* before 1/1/2028 3.22 COP_C, 4.01 *ICOP* on or before 1/1/2028 3.22 COP_C, 4.01 *ICOP* on or before 1/1/2031	AHRI 390
	≥19 kW and <39 kW		2.93 COP_C, 3.28 *ICOP* before 1/1/2028 2.93 COP_C, 3.60 *ICOP* on or after 1/1/2028 2.93 COP_C, 3.93 *ICOP* on or after 1/1/2031	
	≥39 kW ~~and <70 kW~~		2.93 COP_C, 3.28 *ICOP* before 1/1/2028 2.93 COP_C, 3.60 *ICOP* on or after 1/1/2028 2.93 COP_C, 3.93 *ICOP* on or after 1/1/2031	

a. Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

b. Nonstandard size units must be factory *labeled* as follows: "MANUFACTURED FOR NONSTANDARD SIZE APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEW STANDARD PROJECTS." Nonstandard size efficiencies apply only to units being installed in existing sleeves having an external *wall* opening of less than 0.45 m high or less than 1.0 m. wide and having a cross-sectional area less than 0.4 m^2.

c. The cooling-mode wet-bulb temperature requirement only applies for units that reject condensate to the condenser coil.

~~d. *Room air conditioners* are regulated as consumer products by 10 CFR 430. For U.S. applications of *room air conditioners*, refer to Informative Appendix F, Table F-3, for the U.S. DOE minimum efficiency requirements for U.S. applications.~~

~~e~~d."Cap" in COP_C and COP_H equations for *PTAC*s and *PTHP*s means cooling capacity in kW at 35°C outdoor dry-bulb temperature.

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 (SI) *(Continued)*

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency[d]	Test Procedure[a]
SPVHP (heating mode)	<19 kW	8.3°C db/6.1°C wb *outdoor air*	3.3 COP_H before 1/1/2028 3.4 COP_H on or after 1/1/2028 3.5 COP_H on or after 1/1/2031	AHRI 390
	≥19 kW and <39 kW		~~3.0 COP_H~~ 3.3 COP_H before 1/1/2028 3.4 COP_H on or after 1/1/2028 3.5 COP_H on or after 1/1/2031	
	≥39 kW ~~and <240,000 kW~~		~~3.0 COP_H~~ 3.3 COP_H before 1/1/2028 3.4 COP_H on or after 1/1/2028 3.5 COP_H on or after 1/1/2031	

a. Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
b. Nonstandard size units must be factory *labeled* as follows: "MANUFACTURED FOR NONSTANDARD SIZE APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEW STANDARD PROJECTS." Nonstandard size efficiencies apply only to units being installed in existing sleeves having an external *wall* opening of less than 0.45 m high or less than 1.0 m. wide and having a cross-sectional area less than 0.4 m^2.
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~~e~~d."Cap" in COP_C and COP_H equations for *PTAC*s and *PTHP*s means cooling capacity in kW at 35°C outdoor dry-bulb temperature.

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ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

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The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

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