

ADDENDA

**ANSI/ASHRAE/IES Addendum ba 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 October 31, 2025; and by the Illuminating Engineering Society on October 16, 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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FOREWORD

Addendum ba focuses on water-source heat-pump (WSHP) efficiency and metric changes. The addendum was developed to update the referenced AHRI standard for WSHPs, to use a new annualized cooling metric, and to increase the minimum efficiency requirements in Table 6.8.1-15 for water-to-air water-source heat pumps. Changes are being made to the water-to-air products only, as the revised AHRI 600 Standard only covers these products. Water-to-water WSHPs will be addressed later when a revised test and rating standard, AHRI 660, is completed and also for geothermal heat pumps for commercial and residential applications. Some of the capacity categories for water-to-air have been adjusted and a new category for coil-only replacement products has been added.

In the last few years, DOE has promoted moving commercial WSHPs to an IEER metric. IEER is not a metric recognized by ISO, so AHRI began the development of a separate AHRI 600 IEER calculation methodology standard for WSHP as simply an IEER calculation methodology using the original ISO/AHRI/ANSI/ASHRAE 13256-1998 performance data. This draft AHRI 600 WSHP IEER calculation standard went out for public review in the fourth quarter of 2022, but development was halted shortly thereafter.

After a review, the WSHP standards committee felt the recommended DOE changes diverged so significantly from ISO/AHRI/ANSI/ASHRAE 13256-1998 standard that it warranted development of a new AHRI standard and recommended eventually abandoning ISO/AHRI/ANSI/ASHRAE 13256-1998. Beginning in the first quarter of 2023, a new expanded AHRI 600, Performance Rating of Water/Brine to Air Heat Pump Equipment was developed using AHRI 340/360 as a framework and included the IEER methodology from the original AHRI 600. The current version is complete with commercial metrics and includes IEER calculation requirements.

The new test procedure was developed jointly by AHRI industry manufacturers and DOE as part of joint development initiative. The effort was completed in 2023, and the DOE-published final rule can be viewed at:

<https://www.regulations.gov/docket/EERE-2017-BT-TP-0029/unified-agenda>

The AHRI-documented requirements defined in the final rule, along with additional information to support rating and certification programs in the new AHRI 600 standard, can be downloaded at

<https://www.ahrinet.org/system/files/2023-10/ANSI%20AHRI%20Standard%20600-2023%20I-P.pdf>

Addendum ba complements the new AHRI 600 water-to-air IEER metric with the development of proposed minimum efficiency levels based on a crosswalk and with additional efficiency improvement of 10% for smaller space-constrained products and 20% for larger products.

In addition to the change to use the new IEER annualized metric, the AHRI 600 standard includes an increase in external rating static from the current ISO 13256 standard that requires ratings to be based on zero external static. The new AHRI 600 standard rating statics are summarized in the following table:

New AHRI 600 External Rating Static Pressure

Rated Cooling Capacity, kBtu/h	External Static Pressure, in. of water
0 to 28.8	0.10
29.0 to 42.9	0.15
43.0 to 74.9	0.20
75.0 to 134	0.75
135 to 280	1.00
281 and greater	1.50

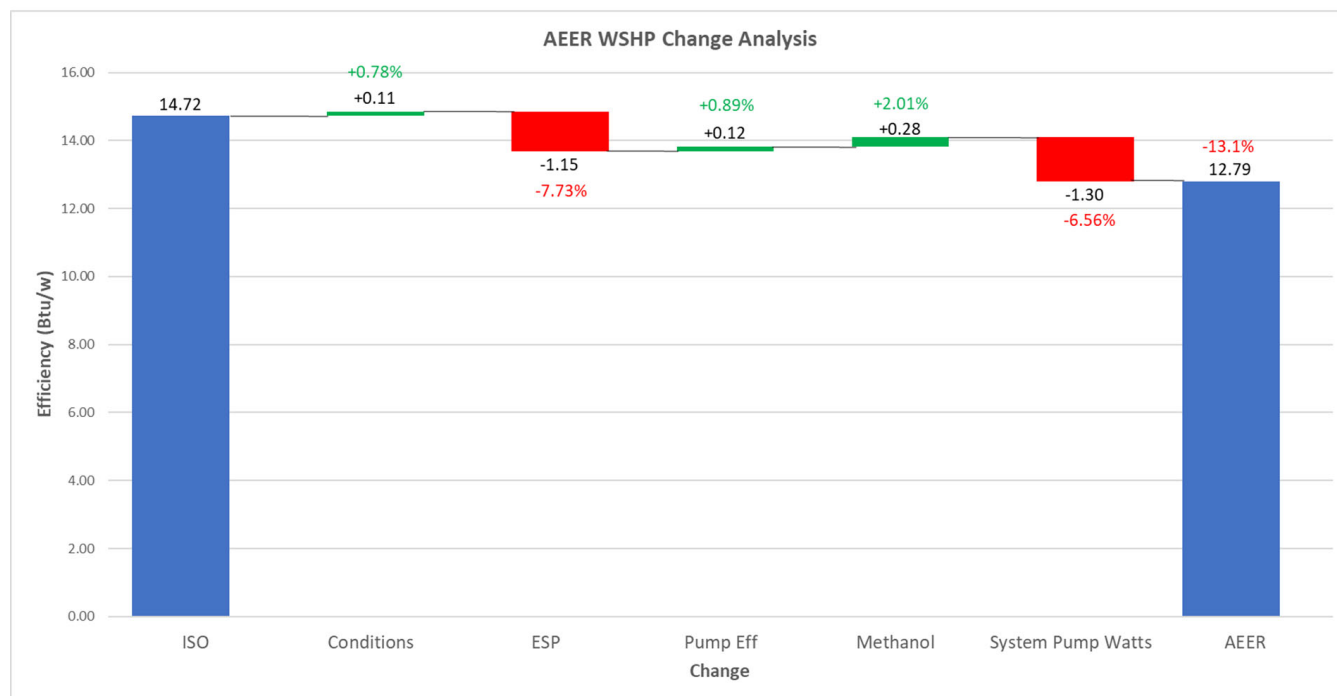
Other notable changes that impact the efficiency of the products include the following:

- *Rating condition changes from hard metric rating conditions defined by ISO 13256*
- *Change in condenser pump efficiency*
- *Adjustment for testing with methanol to remove the impact for ratings with water*
- *Addition of cooling-tower fan power and tower-loop pump power*

Because of all the changes, the full-load metric name for cooling is being changed from EER to AEER (applied EER), and the full-load COP is being changed to ACOP_H (applied heating COP_H).

Details on the development of the new metric and the crosswalk and efficiency improvements are available in the referenced technical support document.

The following is a crosswalk water fall chart showing the impact of all the test and rating procedure changes for a nominal three-ton unit full-load EER:



AHRI has provided average cost increases for the improvement efficiencies reflected in the metrics. Modeling was conducted by the SSPC 90.1 using the medium office reference building using a typical WSHP water-loop cooling-and-heating system. The following weighted average scalar ratios were determined using an economizer life of 15 years, which results in a scalar limit of 11.5 for heating and 11.4 for cooling.

Following are the scalar ratios for the efficiency improvement and product cost increases.

Capacity Range	Energy Cost Only	Energy Cost + Social Cost of Carbon
	0.1122 \$/kW Rate	0.1772 \$/kW
<20,000 Btu/h	2.90	1.83
20,000 to 75,000 Btu/h	5.64	3.57

On average, the scalar ratios without the cost of carbon and with the cost of carbon are below the scalar limit on a weighted average, so the proposed efficiencies are cost justified.

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

Addendum ba to Standard 90.1-2022

Modify Section 3.2 as shown (I-P).

applied heating coefficient of performance (ACOP_H): a ratio of the heating capacity in watts to the power input values in watts at standard rating conditions H2 in AHRI Standard 600, including system pump and cooling tower power, expressed in W/W.

applied energy efficiency ratio (AEER): a ratio of the full-load cooling capacity in British thermal units per hour to the power input values in watts at standard rating conditions C3 in AHRI Standard 600, including system pump and cooling tower power, expressed in Btu/(W·h)

water source heat pump (WSHP): a heat pump that consists of one or more factory-made assemblies with an indoor conditioning coil with air-moving means (except that coil-only indoor or water-to-water units do not have air-moving means), compressor(s), and refrigerant-to-water or refrigerant-to-brine heat exchanger(s), including means to provide both cooling and heating, cooling-only, or heating-only functions.

Modify Section 3.2 as shown (SI).

applied heating coefficient of performance (ACOP_H): a ratio of the heating capacity in watts to the power input values in watts at standard rating conditions H2 in AHRI Standard 600, including system pump and cooling tower power, expressed in W/W.

applied cooling coefficient of performance (ACOP_C): a ratio of the cooling capacity in watts to the power input values in watts at standard rating conditions C3 in AHRI Standard 600, including system pump and cooling tower power, expressed in W/W.

water source heat pump (WSHP): a heat pump that consists of one or more factory-made assemblies with an indoor conditioning coil with air-moving means (except that coil-only indoor or water-to-water units do not have air-moving means), compressor(s), and refrigerant-to-water or refrigerant-to-brine heat exchanger(s), including means to provide both cooling and heating, cooling-only, or heating-only functions.

Modify Section 3.3 as shown (I-P).

$ACOP_H$	<i>applied heating coefficient of performance</i>
$AEER$	<i>applied energy efficiency ratio</i>
$WSHP$	<i>water source heat pump</i>

Modify Section 3.3 as shown (SI).

$ACOP_H$	<i>applied heating coefficient of performance</i>
$ACOP_C$	<i>applied cooling coefficient of performance</i>
$WSHP$	<i>water source heat pump</i>

Modify Table 6.8.1-15 as shown (I-P).

Table 6.8.1-15 Electrically Operated Water Source Heat Pumps—Minimum Efficiency Requirements^b

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure ^a
Water-to-air, water loop (cooling mode)	<17,000 Btu/h	All	86°F entering water	12.2 <i>EER</i>	ISO 13256-1 Before 1/1/2029
	≥17,000 Btu/h and <65,000 Btu/h			13.0 <i>EER</i>	
	≥65,000 Btu/h and <135,000 Btu/h			13.0 <i>EER</i>	
<u>Water-to-air, water loop (cooling mode)</u>	<u><20,000 Btu/h</u>	<u>All</u>	<u>Split-system and single package</u>	<u>10.6 <i>AEER</i></u> <u>14.4 <i>IEER</i></u>	<u>AHRI 600</u> <u>after 1/1/2029</u>
	<u>>20,000 Btu/h and <75,000 Btu/h</u>			<u>11.7 <i>AEER</i></u> <u>17.0 <i>IEER</i></u>	
	<u>>75,000 Btu/h and <135,000 Btu/h</u>			<u>11.0 <i>AEER</i></u> <u>14.9 <i>IEER</i></u>	
	<u>>135,000 Btu/h and <280,000 Btu/h</u>			<u>10.9 <i>AEER</i></u> <u>14.6 <i>IEER</i></u>	
	<u>>280,000 Btu/h</u>			<u>10.3 <i>AEER</i></u> <u>13.8 <i>IEER</i></u>	
<u>Water-to-air, water loop (cooling mode) coil-only replacement^b</u>	<u><37,000 Btu/h</u>		<u>Single package</u>	<u>10.6 <i>AEER</i></u> <u>14.4 <i>IEER</i></u>	<u>AHRI 600</u> <u>after 1/1/2029</u>
Water-to-air, groundwater (cooling mode)	<135,000 Btu/h	All	59°F enter water	18.0 <i>EER</i>	ISO 13256-1
Brine-to-air, ground loop (cooling mode)	<135,000 Btu/h	All	77°F enter water	14.1 <i>EER</i>	ISO 13256-1 Before 1/1/2029
Water-to-air, groundwater (cooling mode)	<135,000 Btu/h	All	59°F enter water	18.0 <i>EER</i>	ISO 13256-1 Before 1/1/2029
Brine to air, ground loop (cooling mode)	<135,000 Btu/h	All	77°F enter water	14.1 <i>EER</i>	ISO 13256-1
Water-to-water, water loop (cooling mode)	<135,000 Btu/h	All	86°F enter water	14.1 <i>EER</i>	ISO 13256-2
Water-to-water, groundwater (cooling mode)	<135,000 Btu/h	All	59°F enter water	14.1 <i>EER</i>	ISO 13256-2
Brine-to-water, ground loop (cooling mode)	<135,000 Btu/h	All	77°F enter water	12.1 <i>EER</i>	ISO 13256-2
Water-to-air, water loop (heating mode)	<135,000 Btu/h (cooling capacity)		68°F enter water	4.3 COP _H	ISO 13256-1 Before 1/1/2029

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

b. Single-phase, U.S. air-cooled heat pumps <65,000 Btu/h are regulated as consumer products by 10 CFR 430. *SEER*, *SEER2*, *HPSF* and *HPSF2* values for single-phase products are set by the U.S. DOE.

b. Coil-only replacement efficiencies apply only to units being installed in existing cabinet applications.

Informative Note: See Informative Appendix F for the U.S. DOE minimum.

Table 6.8.1-15 Electrically Operated Water Source Heat Pumps—Minimum Efficiency Requirements^b (Continued)

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure ^a
<u>Water-to-air, water loop (heating mode)</u>	<u>< 20,000 Btu/h (cooling capacity)</u>		<u>Split-system and single package</u>	<u>3.3 $ACOP_H$</u>	<u>AHRI 600 After 1/1/2029</u>
	<u>>20,000 Btu/h and <75,000 Btu/h (cooling capacity)</u>			<u>3.5 $ACOP_H$</u>	
	<u>>75,000 Btu/h and <135,000 Btu/h (cooling capacity)</u>			<u>3.3 $ACOP_H$</u>	
	<u>>135,000 Btu/h and <280,000 Btu/h (cooling capacity)</u>			<u>3.2 $ACOP_H$</u>	
	<u>>280,000 Btu/h (cooling capacity)</u>			<u>3.2 $ACOP_H$</u>	
<u>Water-to-air, water loop (heating mode) coil-only replacement^b</u>	<u><37,000 Btu/h</u>		<u>Single package</u>	<u>3.3 $ACOP_H$</u>	<u>AHRI 600 After 1/1/2029</u>
Water-to-air, groundwater (heating mode)	<135,000 Btu/h (cooling capacity)		50°F enter water	3.7 COP_H	ISO 13256-1 Before 1/1/2029
Brine-to-air, ground loop (heating mode)	<135,000 Btu/h (cooling capacity)		32°F enter water	3.2 COP_H	ISO 13256-1 Before 1/1/2029
Water-to-water, water loop (heating mode)	<135,000 Btu/h (cooling capacity)		68°F enter water	3.7 COP_H	ISO 13256-2
Water-to-water, groundwater (heating mode)	<135,000 Btu/h (cooling capacity)		50°F enter water	3.1 COP_H	ISO 13256-2
Brine-to-water, ground loop (heating mode)	<135,000 Btu/h (cooling capacity)		32°F enter water	2.5 COP_H	ISO 13256-2

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

b. Single-phase, U.S. air-cooled heat pumps <65,000 Btu/h are regulated as consumer products by 10 CFR 430. SEER, SEER2, HPSF and HPSF2 values for single-phase products are set by the U.S. DOE.

b. Coil-only replacement efficiencies apply only to units being installed in existing cabinet applications.

Informative Note: See Informative Appendix F for the U.S. DOE minimum.

Modify Table 6.8.1-15 as shown (SI).

Table 6.8.1-15 Electrically Operated Water Source Heat Pumps—Minimum Efficiency Requirements^b

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure ^a
Water-to-air, water loop (cooling mode)	< 5 kW	All	30°C enter water	3.58 COP_C	ISO 13256-1
	≥ 5 kW and < 19 kW			3.81 COP_C	
	≥ 65,000 kW and < 40 kW			3.81 COP_C	
<u>Water-to-air, water loop (cooling mode)</u>	<u>< 6 kW</u>	<u>All</u>	<u>Split-system and single package</u>	<u>3.11 $ACOP_C$</u> <u>4.22 $ICOP_C$</u>	<u>AHRI 600</u> <u>After 1/1/2029</u>
	<u>> 6 kW and < 22 kW</u>			<u>3.43 $ACOP_C$</u> <u>4.98 $ICOP_C$</u>	
	<u>> 22 kW and < 40 kW</u>			<u>3.22 $ACOP_C$</u> <u>4.37 $ICOP_C$</u>	
	<u>> 40 kW and < 82 kW</u>			<u>3.19 $ACOP_C$</u> <u>4.28 $ICOP_C$</u>	
	<u>> 82 kW</u>			<u>3.02 $ACOP_C$</u> <u>4.04 $ICOP_C$</u>	
<u>Water-to-air, water loop (heating mode) coil-only replacement^b</u>	<u>< 6 kW</u>	<u>All</u>	<u>Single package</u>	<u>3.3 $ACOP_H$</u>	<u>AHRI 600</u> <u>After 1/1/2029</u>
Water-to-air, groundwater (cooling mode)	< 40 kW	AH	15°C enter water	5.28 COP_C	ISO 13256-1
Brine-to-air, ground loop (cooling mode)	< 40 kW	All	25°C enter water	4.13 COP_C	ISO 13256-1
Water-to-air, groundwater (cooling mode)	< 40 kW	All	15°C enter water	5.28 COP_C	ISO 13256-1
Brine-to-air, ground loop (cooling mode)	< 40 kW	All	25°C enter water	4.13 COP_C	ISO 13256-1
Water-to-water, water loop (cooling mode)	< 40 kW	All	30°C enter water	4.13 COP_C	ISO 13256-1
Water-to-water, groundwater (cooling mode)	< 40 kW	All	15°C enter water	4.13 COP_C	ISO 13256-2
Brine-to-water, ground loop (cooling mode)	< 40 kW	AH	25°C enter water	3.55 COP_C	ISO 13256-2
Water-to-air, water loop (heating mode)	< 40 kW (cooling capacity)		20°C enter water	4.3 COP_H	ISO 13256-1
<u>Water-to-air, water loop (heating mode)</u>	<u>< 6 kW (cooling capacity)</u>		<u>Split-system and single package</u>	<u>3.3 $ACOP_H$</u>	<u>AHRI 600</u> <u>After 1/1/2029</u>
	<u>> 6 kW and < 22 kW (cooling capacity)</u>			<u>3.5 $ACOP_H$</u>	
	<u>> 22 kW and < 40 kW (cooling capacity)</u>			<u>3.3 $ACOP_H$</u>	
	<u>> 40 kW and < 82 kW (cooling capacity)</u>			<u>3.2 $ACOP_H$</u>	
	<u>> 82 kW (cooling capacity)</u>			<u>3.2 $ACOP_H$</u>	

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

b. Single-phase, U.S. air-cooled heat pumps < 65,000 Btu/h are regulated as consumer products by 10 CFR 430. SEER, SEER2, HPSF and HPSF2 values for single-phase products are set by the U.S. DOE.

b. Coil only replacement efficiencies apply only to units being installed in existing cabinet applications.

Informative Note: See Informative Appendix F for the U.S. DOE minimum.

Table 6.8.1-15 Electrically Operated Water Source Heat Pumps—Minimum Efficiency Requirements^b (Continued)

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure ^a
Water-to-air, water loop (heating mode) coil-only replacement ^b	$\leq 11 \text{ kW}$		Single package	3.3 ACOP_H	AHRI 600 After 1/1/2029
Water-to-air, groundwater (heating mode)	$< 40 \text{ kW}$ (cooling capacity)		10°C enter water	3.7 COP_H	ISO 13256-1
Brine-to-air, ground loop (heating mode)	$< 40 \text{ kW}$ (cooling capacity)		0°C enter water	3.2 COP_H	ISO 13256-1
Water-to-water, water loop (heating mode)	$< 40 \text{ kW}$ (cooling capacity)		20°C enter water	3.7 COP_H	ISO 13256-2
Water-to-water, groundwater (heating mode)	$< 40 \text{ kW}$ (cooling capacity)		10°C enter water	3.1 COP_H	ISO 13256-2
Brine-to-water, ground loop (heating mode)	$< 40 \text{ kW}$ (cooling capacity)		0°C enter water	2.5 COP_H	ISO 13256-2

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

b. Single-phase, U.S. air-cooled heat pumps $< 65,000 \text{ Btu/h}$ are regulated as consumer products by 10 CFR 430. SEER, SEER2, HPSF and HPSF2 values for single-phase products are set by the U.S. DOE.

b. Coil only replacement efficiencies apply only to units being installed in existing cabinet applications.

Informative Note: See Informative Appendix F for the U.S. DOE minimum.

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

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.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

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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