



**BSR/ASHRAE/IES Addendum BM  
to ANSI/ASHRAE/IES Standard 90.1-2016**

**Public Review Draft**

# **Proposed Addendum BM to Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings**

**Second Public Review (February 2019)  
(Draft Shows Proposed Independent Substantive  
Changes to Previous Public Review Draft)**

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website at [www.ashrae.org/standards-research-technology/public-review-drafts](http://www.ashrae.org/standards-research-technology/public-review-drafts) and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the standard (as modified by any published addenda on the ASHRAE website) remains in effect. The current edition of any standard may be purchased from the ASHRAE Online Store at [www.ashrae.org/bookstore](http://www.ashrae.org/bookstore) or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

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**(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)**

## FOREWORD

*This addendum updates table 6.8.1-2 for the following changes;*

- 1. Updates the requirements for air cooled >65,000 to >240,000 Btu/h products to show the agreed to Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) efficiencies that are schedule to go into effect on 1/1/2023. Note that DOE requirements extend to 760,000 Btu/h but table 6.8.1 lumps all very large heat pumps into one category >240,000 Btu/h (rather than specifying separate, less stringent levels for heat pumps >760,000 Btu/h) due to the fact that there are no very large heat pumps produced.*
- 2. Update the air cooled <65,000 Btu/h 3 phase US efficiencies to harmonize with the DOE national efficiencies for single phase. This also includes conversion to the new SEER2 and HSPF2 metric that is defined in the 10 CFR Appendix M1 that goes into effect on 1/1/2023 for single phase product. The effective date for three phase will also be 1/1/2023 and is the same as single phase.*
- 3. Clarified that air cooled <65,000 Btu/h single phase efficiencies outside the US are covered by this table. <65K single phase requirements are regulated as consumer products by DOE and are covered in appendix F*
- 4. With the change to the new SEER2, EER2, and HSPF2 metric there are new test procedures that need to be followed. DOE has defined these in 10 CFR 430 Appendix M1. AHRI is modifying AHRI 210/240 to create a new version called AHRI 210/240-2023 that will be released in January 2019. In the referenced test procedures the requirements are clarified what standard should be used when.*
- 5. Updated to name for thru the wall units to space constrained air cooled and clarified they are for non-US and 3 phase global products. Also updated the efficiency levels to align with DOE requirements defined in appendix F table F-1 for single phase equipment.*
- 6. Updated the small duct high velocity requirements to align with DOE requirements defined in table F-1 and clarified they are for non-US productions and 3 phase global products. Also updated the efficiency levels to align with DOE requirements defined in appendix F table F-1 for single phase equipment.*
- 7. To reduce the complexity of the table and in anticipation of new metrics that will be proposed for water source heat pumps the water source heat pumps requirements have been moved to a new table 6.8.1-17 but with the current efficiency metrics.*
- 8. Changes have also been made to Table F-1 for residential DOE covered products but these will be covered by another addendum.*
- 9. Removed some text at the end of 6.4.1 that is redundant to information already in the footnotes of the tables.*

*This is document is an ISC to the first public review and only the changes of the ISC are available for comment. The changes made by the ISC are;*

1. *The language used to clarify requirements for applications in the US and outside the US will be updated to use the same standard language for all addendum impacted by this requirement*
2. *To support the change to SEER2 and HSPF2 we need to have a new reference for the procedures for these metrics. DOE and the industry developed the 10 CFR 430 Appendix M1 but it does not include everything needed to rate a product and support certification so AHRI is in the process of updating AHRI 210/240 and will release AHRI 210/240-2023. This document is nearly completed and targeted to be approved in February 2019 so we have included the reference to AHRI 210/240-2023 effective 1/1/2023*

*Note that the Water Source product requirements have been moved to another table and there were no comments on the first public review but for clarity we have included them in the table in strike out text, but they are not open for comment.*

*The economic justification for more stringent efficiency levels for air-cooled <65K single phase and air-cooled 65K to 760K was addressed in the DOE rulemaking documents for the applicable energy conservation standards rulemakings. Note there are no heat pump products above 240K*

***[Note to Reviewers: This public review draft makes proposed independent substantive changes to the previous public review draft. These changes are indicated in the text by underlining (for additions) and ~~striketrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the previous draft are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed substantive changes.]***

## Addendum BM to 90.1-2016

Modify the IP standard as follows with the following ISC revisions to table 6.8.1-2 The WSHP's were moved to table 17. They are shown in the table for clarity but are not changed by the ISC

**Table 6.8.1-2 Electrically Operated Air Cooled Unitary Pumps—Minimum Efficiency Requirements**

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure <sup>a</sup>
Air cooled (cooling mode)	<65,000 Btu/h <sup>b</sup>	All	Split system, three phase and <u>applications</u> outside US single phase <sup>b</sup>	14.0 SEER before 1/1/2023 14.3 SEER2 after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
			Single package three phase and <u>applications</u> outside US single phase <sup>b</sup>	14.0 SEER before 1/1/2023 <del>13.444.3</del> SEER2 after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Space Constrained air cooled (cooling mode)	≤30,000 Btu/h <sup>b</sup>	All	Split system, three phase and <u>applications</u> outside US single phase <sup>b</sup>	12.0 SEER before 1/1/2023 11.7 SEER2 after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
			Single package three phase and <u>applications</u> outside US single phase <sup>b</sup>	12.0 SEER before 1/1/2023 11.7 SEER2 after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Small duct, high velocity, air cooled (cooling mode)	<65,000 Btu/h <sup>b</sup>	All	Split System, three phase and <u>applications</u> outside US single phase <sup>b</sup>	<del>14.0</del> 12.0 SEER before 1/1/2023 12.0 SEER2 After 1/1/2023	AHRI 210/240-2017 before 1/1/2023  AHRI 210/240-2023 after 1/1/2023
Air cooled (cooling mode)	≥65,000 Btu/h and <135,000 Btu/h	Electric resistance (or none)	Split system and single package	11.0 EER 12.2 IEER before 1/1/2023 14.1 IEER after 1/1/2023	AHRI 340/360
		All other		10.8 EER 12.0 IEER before 1/1/2023 13.9 IEER after 1/1/2023	
	≥135,000 Btu/h and <240,000 Btu/h	Electric resistance (or none)		10.6 EER 11.6 IEER before 1/1/2023 13.5 IEER after 1/1/2023	
		All other		10.4 EER 11.4 IEER before 1/1/2023 13.3 IEER after 1/1/2023	
	≥240,000 Btu/h	Electric resistance (or none)		9.5 EER 10.6 IEER before 1/1/2023 12.5 IEER after 1/1/2023	
		All other		9.3 EER 10.4 IEER before 1/1/2023 12.3 IEER after 1/1/2023	
Water to air, water loop (cooling mode)	<17,000 Btu/h	All	86°F entering water	12.2 EER	ISO 13256-1
	≥17,000 Btu/h and <65,000 Btu/h			13.0 EER	
	≥65,000 Btu/h and <135,000 Btu/h			13.0 EER	

Water to air, groundwater (cooling mode)	<135,000 Btu/h	All	59°F entering water	18.0 <i>EER</i>	ISO 13256-1
Brine to air, ground loop (cooling mode)	<135,000 Btu/h	All	77°F entering water	14.1 <i>EER</i>	ISO 13256-1
Water to water, water loop (cooling mode)	<135,000 Btu/h	All	86°F entering water	10.6 <i>EER</i>	ISO 13256-2
Water to water, groundwater (cooling mode)	<135,000 Btu/h	All	59°F entering water	16.3 <i>EER</i>	ISO 13256-2
Brine to water, ground loop (cooling mode)	<135,000 Btu/h	All	77°F entering water	12.1 <i>EER</i>	ISO 13256-2
Air cooled (heating mode)	<65,000 Btu/h <sup>b</sup> (cooling capacity)		Split system, three phase and <u>applications</u> outside US single phase <sup>b</sup>	8.2 <i>HSPF</i> before 1/1/2023 7.5 <i>HSPF2</i> after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
			Single package, three phase and <u>applications</u> outside US single phase <sup>b</sup>	8.0 <i>HSPF</i> before 1/1/2023 6.7 <i>HSPF2</i> after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Space constrained, air cooled (heating mode)	≤30,000 Btu/h <sup>b</sup> (cooling capacity)		Split system, three <u>applications</u> outside US single phase <sup>b</sup>	7.4 <i>HSPF</i> before 1/1/2023 6.3 <i>HSPF2</i> after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
			Single package, three phase and <u>applications</u> outside US single phase <sup>b</sup>	7.4 <i>HSPF</i> before 1/1/2023 6.3 <i>HSPF2</i> after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Small duct high velocity, air cooled (heating mode)	<65,000 Btu/h <sup>b</sup>		Split system, three phase and <u>applications</u> outside US single phase <sup>b</sup>	6.8 7.2 <i>HSPF</i> before 1/1/2023 6.1 <i>HSPF2</i> after 1/1/2023	AHRI 210/240-2017 before 1/1/2023  AHRI 210/240-2023 after 1/1/2023
Air cooled (heating mode)	≥65,000 Btu/h <sup>e</sup> and <135,000 Btu/h (cooling capacity)		47°F db/43°F wb outdoor air	3.30 <i>COP<sub>H</sub></i> before 1/1/2023 3.40 <i>COP<sub>H</sub></i> after 1/1/2023	AHRI 340/360
			17°F db/15°F wb outdoor air	2.25 <i>COP<sub>H</sub></i>	
	≥135,000 Btu/h <sup>e</sup> (cooling capacity) and <240,000 Btu/h <sup>e</sup>		47°F db/43°F wb outdoor air	3.20 <i>COP<sub>H</sub></i> before 1/1/2023 3.30 <i>COP<sub>H</sub></i> after 1/1/2023	
			17°F db/15°F wb outdoor air	2.05 <i>COP<sub>H</sub></i>	
≥240,000 Btu/h <sup>e</sup> (cooling capacity)		47°F db/43°F wb outdoor air	3.20 <i>COP<sub>H</sub></i>		
		17°F db/15°F wb outdoor air	2.05 <i>COP<sub>H</sub></i>		
Water to air, water loop (heating mode)	<135,000 Btu/h (cooling capacity)		68°F entering water	4.3 <i>COP<sub>H</sub></i>	ISO 13256-1

Water to air, groundwater (heating mode)	<135,000 Btu/h (cooling capacity)		50°F entering water	3.7 COP <sub>H</sub>	ISO 13256-1
Brine to air, ground loop (heating mode)	<135,000 Btu/h (cooling capacity)		32°F entering fluid	3.2 COP <sub>H</sub>	ISO 13256-1
Water to water, water loop (heating mode)	<135,000 Btu/h (cooling capacity)		68°F entering water	3.7 COP <sub>H</sub>	ISO 13256-2
Water to water, groundwater (heating mode)	<135,000 Btu/h (cooling capacity)		50°F entering water	3.1 COP <sub>H</sub>	ISO 13256-2
Brine to water, ground loop (heating mode)	<135,000 Btu/h (cooling capacity)		32°F entering fluid	2.5 COP <sub>H</sub>	ISO 13256-2

a. Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

b. Single-phase, air-cooled heat pumps <65,000 Btu/h are regulated as consumer products by the U.S. Department of Energy Code of Federal Regulations 10 CFR 430.

SEER, SEER2, and HSPF and HSPF2 values for single-phase products are set by the U.S. Department of Energy.

**Informative Note:** See Informative Appendix F for the U.S. Department of Energy minimum for US applications.

*Move the water source IP heat pumps to a new table 6.8.1-8. Note the efficiency values have not been changed and therefore are not open to comment although they are underlined to indicate they are in a new table. No changes made to this as part of the ISC and are just included for clarity*

**Table 6.8.1-17 Electrically Operated Water Source Heat Pumps—Minimum Efficiency Requirements**

<b>Equipment Type</b>	<b>Size Category</b>	<b>Heating Section Type</b>	<b>Subcategory or Rating Condition</b>	<b>Minimum Efficiency</b>	<b>Test Procedure<sup>a</sup></b>
Water to air, water loop (cooling mode)	<17,000 Btu/h	All	86°F entering water	12.2 <i>EER</i>	ISO 13256-1
	≥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>	
Water to air, groundwater (cooling mode)	<135,000 Btu/h	All	59°F entering water	18.0 <i>EER</i>	ISO 13256-1
Brine to air, ground loop (cooling mode)	<135,000 Btu/h	All	77°F entering water	14.1 <i>EER</i>	ISO 13256-1
Water to water, water loop (cooling mode)	<135,000 Btu/h	All	86°F entering water	10.6 <i>EER</i>	ISO 13256-2
Water to water, groundwater (cooling mode)	<135,000 Btu/h	All	59°F entering water	16.3 <i>EER</i>	ISO 13256-2
Brine to water, ground loop (cooling mode)	<135,000 Btu/h	All	77°F entering water	12.1 <i>EER</i>	ISO 13256-2
Water to air, water loop (heating mode)	<135,000 Btu/h (cooling capacity)		68°F entering water	4.3 <i>COP<sub>H</sub></i>	ISO 13256-1
Water to air, groundwater (heating mode)	<135,000 Btu/h (cooling capacity)		50°F entering water	3.7 <i>COP<sub>H</sub></i>	ISO 13256-1
Brine to air, ground loop (heating mode)	<135,000 Btu/h (cooling capacity)		32°F entering fluid	3.2 <i>COP<sub>H</sub></i>	ISO 13256-1
Water to water, water loop (heating mode)	<135,000 Btu/h (cooling capacity)		68°F entering water	3.7 <i>COP<sub>H</sub></i>	ISO 13256-2
Water to water, groundwater (heating mode)	<135,000 Btu/h (cooling capacity)		50°F entering water	3.1 <i>COP<sub>H</sub></i>	ISO 13256-2
Brine to water, ground loop (heating mode)	<135,000 Btu/h (cooling capacity)		32°F entering fluid	2.5 <i>COP<sub>H</sub></i>	ISO 13256-2

a. Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

Modify table 6.8.1-2 SI as shown for the ISC revisions.

**Table 6.8.1-2 Electrically Operated Air Cooled Unitary Heat Pumps—Minimum Efficiency Requirements**

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure <sup>a</sup>
Air cooled (cooling mode)	<19 kW	All	Split system, three phase and <u>applications</u> outside US single phase <sup>b</sup>	4.10 SCOP <sub>C</sub> before 1/1/2023 4.19 SCOP <sub>2C</sub> after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
			Single package, three phase and <u>applications</u> outside US single phase <sup>b</sup>	4.10 SCOP <sub>C</sub> before 1/1/2023 <del>3.93</del> 4.19 SCOP <sub>2C</sub> after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Through the wall, air cooled (cooling mode)	≤9 kW	All	Split system, three phase and <u>applications</u> outside US single phase <sup>b</sup>	3.52 SCOP <sub>C</sub> before 1/1/2023 3.42 SCOP <sub>2C</sub> after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
			Single package, three phase and <u>applications</u> outside US single phase <sup>b</sup>	3.52 SCOP <sub>C</sub> before 1/1/2023 3.42 SCOP <sub>2C</sub> after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Small duct, high velocity, air cooled ( <u>cooling mode</u> )	<19 kW	All	Single package, three phase and <u>applications</u> outside US single phase <sup>b</sup>	<del>2.93</del> 4.10 SCOP <sub>C</sub> before 1/1/2023 4.10 SCOP <sub>2C</sub> after 1/1/2023	AHRI 210/240-2017 before 1/1/2023  AHRI 210/240-2023 after 1/1/2023
Air cooled (cooling mode)	≥19 kW and <40 kW	Electric resistance (or none)	Split system and single package	3.22 COP <sub>C</sub> <del>3.57</del> 3.58 ICOP <sub>C</sub> before 1/1/2023 4.13 ICOP <sub>C</sub> before 1/1/2023	AHRI 340/360
		All other		3.17 COP <sub>C</sub> 3.52 ICOP <sub>C</sub> before 1/1/2023 4.07 ICOP <sub>C</sub> after 1/1/2023	
	≥40 kW and <70 kW	Electric resistance (or none)		3.11 COP <sub>C</sub> 3.40 ICOP <sub>C</sub> before 1/1/2023 3.96 ICOP <sub>C</sub> after 1/1/2023	
		All other		3.05 COP <sub>C</sub> 3.34 ICOP <sub>C</sub> before 1/1/2023 3.90 ICOP <sub>C</sub> after 1/1/2023	
	≥70 kW	Electric resistance (or none)		2.78 COP <sub>C</sub> 3.11 ICOP <sub>C</sub> before 1/1/2023 3.66 ICOP <sub>C</sub> after 1/1/2023	
		All other		<del>2.72</del> 2.73 COP <sub>C</sub> 3.05 ICOP <sub>C</sub> before 1/1/2023 3.60 ICOP <sub>C</sub> after 1/1/2023	
Water to air, water loop (cooling mode)	<5 kW	All	30°C entering water	<del>3.57</del> COP <sub>C</sub>	ISO 13256-4
	≥5 kW and <19 kW			3.81 COP <sub>C</sub>	
	≥19 kW and <40 kW			3.81 COP <sub>C</sub>	
Water to air, ground-water (cooling mode)	<40 kW	All	15°C entering water	5.27 COP <sub>C</sub>	ISO 13256-4
Brine to air, ground-loop (cooling mode)	<40 kW	All	25°C entering water	4.13 COP <sub>C</sub>	ISO 13256-4
Water to water, water loop (cooling mode)	<40 kW	All	30°C entering water	3.10 COP <sub>C</sub>	ISO 13256-2



Water to water, groundwater (cooling mode)	<40 kW	All	15°C entering water	4.77 COP <sub>c</sub>	ISO 13256-2
Brine to water, ground loop (cooling mode)	<40 kW	All	25°C entering water	3.55 COP <sub>c</sub>	ISO 13256-2
Air cooled (heating mode)	<19 kW <sup>b</sup> (cooling capacity)		Split system, three phase and <u>applications</u> outside US single phase	-2.40 SCOP <sub>H</sub> before 1/1/2023 2.20 SCOP <sub>2H</sub> after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
			Single Package, three phase and outside US single phase	2.34 SCOP <sub>H</sub> before 1/1/2023 1.96 SCOP <sub>2H</sub> after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Through the wall, Space constrained air cooled (heating mode)	≤9 kW <sup>b</sup> (cooling capacity)		Split system, three phase and <u>applications</u> outside US single phase	2.17 SCOP <sub>H</sub> before 1/1/2023 1.83 SCOP <sub>H</sub> after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
			Single Package, three phase and <u>applications</u> outside US single phase	2.17 SCOP <sub>H</sub> before 1/1/2023 1.83 SCOP <sub>H</sub> after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Small duct high velocity, air cooled (heating mode)	<19 kW <sup>b</sup>		Single Package, three phase and <u>applications</u> outside US single phase	2.0 2.11 SCOP <sub>H</sub> before 1/1/2023	AHRI 210/240-2017 before 1/1/2023
				1.78 SCOP <sub>H</sub> after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Air cooled (heating mode)	≥19 kW and <40 kW (cooling capacity)		8.3°C db/6.1°C wb outdoor air	3.30 COP <sub>H</sub> before 1/1/2023 3.40 COP <sub>H</sub> after 1/1/2023	AHRI 340/360
			-8.3°C db/-9.4°C wb outdoor air	2.25 COP <sub>H</sub>	
	≥40 kW and <70 kW (cooling capacity)		8.3°C db/6.1°C wb outdoor air	3.20 COP <sub>H</sub> before 1/1/2023 3.30 COP <sub>H</sub> after 1/1/2023	
			-8.3°C db/-9.4°C wb outdoor air	2.05 COP <sub>H</sub>	
≥70 kW (cooling capacity)		8.3°C db/6.1°C wb outdoor air	3.20 COP <sub>H</sub>		
		-8.3°C db/-9.4°C wb outdoor air	2.05 COP <sub>H</sub>		
Water to air, water loop (heating mode)	<40 kW (cooling capacity)		20°C entering water	4.3 COP <sub>H</sub>	ISO 13256-1
Water to air, groundwater (heating mode)	<40 kW (cooling capacity)		10°C entering water	3.7 COP <sub>H</sub>	ISO 13256-1
Brine to air, ground loop (heating mode)	<40 kW (cooling capacity)		0°C entering fluid	3.2 COP <sub>H</sub>	ISO 13256-1
Water to water, water loop (heating mode)	<40 kW (cooling capacity)		20°C entering water	3.7 COP <sub>H</sub>	ISO 13256-2
Water to water, groundwater (heating mode)	<40 kW (cooling capacity)		10°C entering water	3.1 COP <sub>H</sub>	ISO 13256-2
Brine to water, ground loop (heating mode)	<40 kW (cooling capacity)		0°C entering fluid	2.5 COP <sub>H</sub>	ISO 13256-2

- a. Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
- b. Single-phase, US air-cooled heat pumps <19 kW are regulated as consumer products by the U.S. Department of Energy Code of Federal Regulations 10 CFR 430. SCOP<sub>c</sub>, SCOP<sub>2c</sub> and SCOP<sub>H</sub>, and SCOP<sub>2H</sub> values for single-phase products are set by the U.S. Department of Energy.

**Informative Note:** See Informative [Appendix F](#) for the U.S. Department of Energy minimum for US applications.

*Move the water source SI heat pumps to a new table 6.8.1-8. Note the values have not been changed and therefore are not open to comment although they are underlined to indicate they are in a new table..*

**Table 6.8.1-17 Electrically Operated Water Source Heat Pumps—Minimum Efficiency Requirements**

<u>Equipment Type</u>	<u>Size Category</u>	<u>Heating Section Type</u>	<u>Subcategory or Rating Condition</u>	<u>Minimum Efficiency</u>	<u>Test Procedure<sup>a</sup></u>
<u>Water to air, water loop (cooling mode)</u>	<u>&lt;5 kW</u>	<u>All</u>	<u>30°C entering water</u>	<u>3.58 COP<sub>C</sub></u>	ISO 13256-1
	<u>≥5 kW and &lt;19 kW</u>			<u>3.81 COP<sub>C</sub></u>	
	<u>≥19 kW and &lt;40 kW</u>			<u>3.81 COP<sub>C</sub></u>	
<u>Water to air, groundwater (cooling mode)</u>	<u>&lt;40 kW</u>	<u>All</u>	<u>15°C entering water</u>	<u>5.28 COP<sub>C</sub></u>	ISO 13256-1
<u>Brine to air, ground loop (cooling mode)</u>	<u>&lt;40 kW</u>	<u>All</u>	<u>25°C entering water</u>	<u>4.13 COP<sub>C</sub></u>	ISO 13256-1
<u>Water to water, water loop (cooling mode)</u>	<u>&lt;40 kW</u>	<u>All</u>	<u>30°C entering water</u>	<u>3.11 COP<sub>C</sub></u>	ISO 13256-2
<u>Water to water, groundwater (cooling mode)</u>	<u>&lt;40 kW</u>	<u>All</u>	<u>15°C entering water</u>	<u>4.78 COP<sub>C</sub></u>	ISO 13256-2
<u>Brine to water, ground loop (cooling mode)</u>	<u>&lt;40 kW</u>	<u>All</u>	<u>25°C entering water</u>	<u>3.55 COP<sub>C</sub></u>	ISO 13256-2
<u>Water to air, water loop (heating mode)</u>	<u>&lt;40 kW (cooling capacity)</u>		<u>20°C entering water</u>	<u>4.3 COP<sub>H</sub></u>	ISO 13256-1
<u>Water to air, groundwater (heating mode)</u>	<u>&lt;40 kW (cooling capacity)</u>		<u>10°C entering water</u>	<u>3.7 COP<sub>H</sub></u>	ISO 13256-1
<u>Brine to air, ground loop (heating mode)</u>	<u>&lt;40 kW (cooling capacity)</u>		<u>0°C entering fluid</u>	<u>3.2 COP<sub>H</sub></u>	ISO 13256-1
<u>Water to water, water loop (heating mode)</u>	<u>&lt;40 kW (cooling capacity)</u>		<u>20°C entering water</u>	<u>3.7 COP<sub>H</sub></u>	ISO 13256-2
<u>Water to water, groundwater (heating mode)</u>	<u>&lt;40 kW (cooling capacity)</u>		<u>10°C entering water</u>	<u>3.1 COP<sub>H</sub></u>	ISO 13256-2
<u>Brine to water, ground loop (heating mode)</u>	<u>&lt;40 kW (cooling capacity)</u>		<u>0°C entering fluid</u>	<u>2.5 COP<sub>H</sub></u>	ISO 13256-2

a. Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

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**Clean Version representing final Addendum structure when published in the 2019 standard including other addenda that also revised sections being revised by this addendum  
(reference only and not for comment)**

Addendum BD, BM, BE and BR make changes to section 6.4 but there are no conflicts and no additional changes are required.

This is the final modified section 6.4 with all the changes of BD, BM, BE, BR

## **6.4 Mandatory Provisions**

### **6.4.1 Equipment Efficiencies, Verification, and Labeling Requirements**

#### **6.4.1.1 Minimum Equipment Efficiencies—Listed Equipment—Standard Rating and Operating Conditions**

*Equipment* shown in Tables [6.8.1-1](#) through 6.8.1-18 shall have a minimum performance at the specified rating conditions when tested in accordance with the specified test procedure. Where multiple rating conditions or performance requirements are provided, the *equipment* shall satisfy all stated requirements unless otherwise exempted by footnotes in the table. *Equipment* covered under the Federal Energy Policy Act of 1992 (EPACT) shall have no minimum *efficiency* requirements for operation at minimum capacity or other than standard rating conditions. *Equipment* used to provide *service water-heating* functions as part of a combination *system* shall satisfy all stated requirements for the appropriate *space* heating or cooling category.

Tables are as follows:

- a. Table [6.8.1-1](#), “Electrically Operated Unitary Air Conditioners and *Condensing Units*—Minimum *Efficiency* Requirements”
- b. Table [6.8.1-2](#), “Electrically Operated Air Cooled Unitary Heat Pumps—Minimum *Efficiency* Requirements”
- c. Table [6.8.1-3](#), “Water-Chilling Packages—*Efficiency* Requirements” (See Section 6.4.1.2 for water-cooled centrifugal water-chilling packages that are designed to operate at nonstandard conditions.)
- d. 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”
- e. Table [6.8.1-5](#), “Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters—Minimum *Efficiency* Requirements”
- f. Table [6.8.1-6](#), “Gas- and Oil-Fired *Boilers*—Minimum *Efficiency* Requirements”
- g. Table [6.8.1-7](#), “Performance Requirements for Heat-Rejection *Equipment*”
- h. Table [6.8.1-8](#), “Heat Transfer *Equipment*”
- i. Table [6.8.1-9](#), “Electrically Operated Variable-Refrigerant-Flow Air Conditioners—Minimum *Efficiency* Requirements”
- j. Table [6.8.1-10](#), “Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps—Minimum *Efficiency* Requirements”
- k. Table [6.8.1-11](#), “Floor Mounted Air Conditioners and *Condensing Units* Serving *Computer Rooms*”
- l. Table [6.8.1-13](#), “Commercial Refrigerators, Commercial Freezers, and Refrigeration—Minimum *Efficiency* Requirements”
- n. Table [6.8.1-14](#), “Vapor-Compression-Based *Indoor Pool Dehumidifiers*—Minimum *Efficiency* Requirements”

- o. Table [6.8.1-15](#), “Electrically Operated *DX-DOAS Units*, Single-Package and Remote Condenser, without *Energy Recovery*—Minimum *Efficiency Requirements*”
- p. Table [6.8.1-16](#), “Electrically Operated *DX-DOAS Units*, Single-Package and Remote Condenser, with *Energy Recovery*—Minimum *Efficiency Requirements*”
- q. Table 6.8.1-17, “Electrically Operated Water Source Heat Pumps—Minimum Efficiency Requirements”
- r. Table 6.8.1-18, Heat Pump and Heat Recovery Chiller Packages – Minimum Efficiency Requirement
- s. Table 6.8.1-19, Ceiling Mounted Computer Room Air Conditioners – Minimum Efficiency Requirements

The tables and other changes are not impacted by other addenda but the following is what the final version will look like for the other changes.

**Table 6.8.1-2 Electrically Operated Air Cooled Unitary and Applied Heat Pumps—Minimum Efficiency Requirements**

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure <sup>a</sup>
Air cooled (cooling mode)	<65,000 Btu/h <sup>b</sup>	All	Split system, three phase and applications outside US single phase <sup>b</sup>	14.0 SEER before 1/1/2023 14.3 SEER2 after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
			Single package three phase and applications outside US single phase <sup>b</sup>	14.0 SEER before 1/1/2023 13.4 SEER2 after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Space Constrained air cooled (cooling mode)	≤30,000 Btu/h <sup>b</sup>	All	Split system, three phase and applications outside US single phase <sup>b</sup>	12.0 SEER before 1/1/2023 11.7 SEER2 after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
			Single package three phase and applications outside US single phase <sup>b</sup>	12.0 SEER before 1/1/2023 11.7 SEER2 after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Small duct, high velocity, air cooled (cooling mode)	<65,000 Btu/h <sup>b</sup>	All	Split System, three phase and applications outside US single phase <sup>b</sup>	14.0-12.0 -SEER before 1/1/2023 12.0 SEER2 After 1/1/2023	AHRI 210/240-2017 before 1/1/2023  AHRI 210/240-2023 after 1/1/2023
Air cooled (cooling mode)	≥65,000 Btu/h and <135,000 Btu/h	Electric resistance (or none)	Split system and single package	11.0 EER 12.2 IEER before 1/1/2023 14.1 IEER after 1/1/2023	AHRI 340/360
		All other		10.8 EER 12.0 IEER before 1/1/2023 13.9 IEER after 1/1/2023	
	≥135,000 Btu/h and <240,000 Btu/h	Electric resistance (or none)	10.6 EER 11.6 IEER before 1/1/2023 13.5 IEER after 1/1/2023		
		All other	10.4 EER 11.4 IEER before 1/1/2023 13.3 IEER after 1/1/2023		
	≥240,000 Btu/h	Electric resistance (or none)	9.5 EER 10.6 IEER before 1/1/2023 12.5 IEER after 1/1/2023		
		All other	9.3 EER 10.4 IEER before 1/1/2023 12.3 IEER after 1/1/2023		

Air cooled (heating mode)	<65,000 Btu/h <sup>b</sup> (cooling capacity)		Split system, three phase and applications outside US single phase <sup>b</sup>	8.2 <i>HSPF</i> before 1/1/2023 7.5 <i>HSPF2</i> after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
			Single package, three phase and applications outside US single phase <sup>b</sup>	8.0 <i>HSPF</i> before 1/1/2023 6.7 <i>HSPF2</i> after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Space constrained, air cooled (heating mode)	≤30,000 Btu/h <sup>b</sup> (cooling capacity)		Split system, three applications outside US single phase <sup>b</sup>	7.4 <i>HSPF</i> before 1/1/2023 6.3 <i>HSPF2</i> after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
			Single package, three phase and applications outside US single phase <sup>b</sup>	7.4 <i>HSPF</i> before 1/1/2023 6.3 <i>HSPF2</i> after 1/1/2023	AHRI 210/240-2023 after 1/1/2023
Small duct high velocity, air cooled (heating mode)	<65,000 Btu/h <sup>b</sup>		Split system, three phase and applications outside US single phase <sup>b</sup>	7.2 <i>HSPF</i> before 1/1/2023 6.1 <i>HSPF2</i> after 1/1/2023	AHRI 210/240-2017 before 1/1/2023
					AHRI 210/240-2023 after 1/1/2023
Air cooled (heating mode)	≥65,000 Btu/h <sup>e</sup> and <135,000 Btu/h (cooling capacity)		47°F db/43°F wb outdoor air	3.30 <i>COP<sub>H</sub></i> before 1/1/2023 3.40 <i>COP<sub>H</sub></i> after 1/1/2023	AHRI 340/360
			17°F db/15°F wb outdoor air	2.25 <i>COP<sub>H</sub></i>	
	≥135,000 Btu/h <sup>e</sup> (cooling capacity) and <240,000 Btu/h <sup>e</sup>		47°F db/43°F wb outdoor air	3.20 <i>COP<sub>H</sub></i> before 1/1/2023 3.30 <i>COP<sub>H</sub></i> after 1/1/2023	
			17°F db/15°F wb outdoor air	2.05 <i>COP<sub>H</sub></i>	
	≥240,000 Btu/h <sup>e</sup> (cooling capacity)		47°F db/43°F wb outdoor air	3.20 <i>COP<sub>H</sub></i>	
			17°F db/15°F wb outdoor air	2.05 <i>COP<sub>H</sub></i>	

a. Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

b. Single-phase, air-cooled heat pumps <65,000 Btu/h are regulated as consumer products by the U.S. Department of Energy Code of Federal Regulations 10 CFR 430.

*SEER*, *SEER2*, and *HSPF* and *HSPF2* values for single-phase products are set by the U.S. Department of Energy.

**Informative Note:** See Informative Appendix F for the U.S. Department of Energy minimum for US applications

**Table 6.8.1-17 Electrically Operated Water Source Heat Pumps—Minimum Efficiency Requirements**

<b>Equipment Type</b>	<b>Size Category</b>	<b>Heating Section Type</b>	<b>Subcategory or Rating Condition</b>	<b>Minimum Efficiency</b>	<b>Test Procedure<sup>a</sup></b>
Water to air, water loop (cooling mode)	<17,000 Btu/h	All	86°F entering water	12.2 <i>EER</i>	ISO 13256-1
	≥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>	
Water to air, groundwater (cooling mode)	<135,000 Btu/h	All	59°F entering water	18.0 <i>EER</i>	ISO 13256-1
Brine to air, ground loop (cooling mode)	<135,000 Btu/h	All	77°F entering water	14.1 <i>EER</i>	ISO 13256-1
Water to water, water loop (cooling mode)	<135,000 Btu/h	All	86°F entering water	10.6 <i>EER</i>	ISO 13256-2
Water to water, groundwater (cooling mode)	<135,000 Btu/h	All	59°F entering water	16.3 <i>EER</i>	ISO 13256-2
Brine to water, ground loop (cooling mode)	<135,000 Btu/h	All	77°F entering water	12.1 <i>EER</i>	ISO 13256-2
Water to air, water loop (heating mode)	<135,000 Btu/h (cooling capacity)		68°F entering water	4.3 <i>COP<sub>H</sub></i>	ISO 13256-1
Water to air, groundwater (heating mode)	<135,000 Btu/h (cooling capacity)		50°F entering water	3.7 <i>COP<sub>H</sub></i>	ISO 13256-1
Brine to air, ground loop (heating mode)	<135,000 Btu/h (cooling capacity)		32°F entering fluid	3.2 <i>COP<sub>H</sub></i>	ISO 13256-1
Water to water, water loop (heating mode)	<135,000 Btu/h (cooling capacity)		68°F entering water	3.7 <i>COP<sub>H</sub></i>	ISO 13256-2
Water to water, groundwater (heating mode)	<135,000 Btu/h (cooling capacity)		50°F entering water	3.1 <i>COP<sub>H</sub></i>	ISO 13256-2
Brine to water, ground loop (heating mode)	<135,000 Btu/h (cooling capacity)		32°F entering fluid	2.5 <i>COP<sub>H</sub></i>	ISO 13256-2

a. Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

