



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

**Public Review Draft**

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

**Third Public Review Draft (May 2019)  
(Draft Shows Proposed Independent Substantive  
Changes to Previous Public Review Draft)**

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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**

*For the third public review changes are being made to correct references to products in table F-4 to align exactly with the DOE requirements.*

- *The IP and SI versions of Table F-4 should not include “Warm air” in the table title. Additionally, the SI version of Table F-4 should not include “Warm air” in the name of oil fired furnaces.*
- *The test procedure for electric furnaces <225 kBtu/h in the SI version of Table 6.8.1-5 should specifically reference DOE’s test procedure in 10 CFR 430 Appendix N (“ 10 CFR Part 430 Appendix N”) rather than 10 CFR Part 430.*
- *This also remove the word Part from references to the DOE test procedures.*

*[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 strikethrough (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 BO to 90.1-2016

Make the changes as noted below to correct the references to test procedures per the 3<sup>rd</sup> public review ISC.

**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**

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure <sup>a</sup>
Warm-air furnace, gas fired for application outside the US <sup>g</sup>	<225,000 Btu/h	Maximum capacity <sup>c</sup>	80% AFUE (non-weatherized) or 81% AFUE (weatherized) or 80% $E_t$ <sup>b,d</sup>	DOE 10 CFR Part 430 Appendix N or Section 2.39, Thermal Efficiency, ANSI Z21.47
Warm-air furnace, gas fired	≥225,000 Btu/h	Maximum capacity <sup>c</sup>	80% $E_t$ <sup>b,d</sup> before 1/1/2023 81% $E_t$ <sup>d</sup> after 1/1/2023	Section 2.39, Thermal Efficiency, ANSI Z21.47
Warm-air furnace, oil fired for application outside the US <sup>g</sup>	<225,000 Btu/h	Maximum capacity <sup>c</sup>	83% AFUE (non-weatherized) or 78% AFUE (weatherized) or 80% $E_t$ <sup>b,d</sup>	DOE 10 CFR Part 430 Appendix N or Section 42, Combustion, UL 727
Warm-air furnace, oil fired	≥225,000 Btu/h	Maximum capacity <sup>c</sup>	81% $E_t$ <sup>d</sup> before 1/1/2023 82% $E_t$ <sup>d</sup> after 1/1/2023	Section 42, Combustion, UL 727
Electric Furnaces for application outside the US <sup>g</sup>	<225,000 Btu/h	all	78-96% AFUE	DOE 10 CFR Part 430 Appendix N
Warm-air duct furnaces, gas fired	All capacities	Maximum capacity <sup>c</sup>	80% $E_c$ <sup>e</sup>	Section 2.10, Efficiency, ANSI Z83.8
Warm-air unit heaters, gas fired	All capacities	Maximum capacity <sup>c</sup>	80% $E_c$ <sup>e,f</sup>	Section 2.10, Efficiency, ANSI Z83.8
Warm-air unit heaters, oil fired	All capacities	Maximum capacity <sup>c</sup>	80% $E_c$ <sup>e,f</sup>	Section 40, Combustion, UL 731

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

b. Combination units (i.e., furnaces contained within the same cabinet as an air conditioner) not covered by the U.S. Department of Energy Code of Federal Regulations 10 CFR 430 (i.e., three-phase power or with cooling capacity greater than or equal to 65,000 Btu/h) may comply with either rating. All other units <225 kBtu/h sold in the US must meet the AFUE standards for consumer products and test using DOE's AFUE test procedure at 10 CFR 430 Subpart B Appendix N.

c. Compliance of multiple firing rate units shall be at the maximum firing rate.

d.  $E_t$  = thermal efficiency. Units must also include an interrupted or intermittent ignition device (IID), have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.

e.  $E_c$  = combustion efficiency (100% less flue losses). See test procedure for detailed discussion.

f. Units must also include an interrupted or intermittent ignition device (IID) and have either power venting or an automatic flue damper.

g. For US applications of federal covered <225,000 Btu/h products see appendix F table F-4

Make the following changes to the IP table F-4 as part of the 3<sup>rd</sup> public review ISC

Table F-4 Residential ~~Warm Air~~ Furnaces – Minimum Efficiency Requirements for US applications (see 10 CFR Part 430)

Product Class	Size Category (input)	Subcategory or rating condition	Minimum Efficiency	Test Procedure <sup>a</sup>
Furnace, gas fired	<225,000 Btu/h	Non-weatherized excluding mobile home	80% AFUE	10 CFR 430 Appendix N
		Non-weatherized mobile home	80% AFUE	
		Weatherized	81% AFUE	
Furnace oil fired	<225,000 Btu/h	Non-weatherized excluding mobile home	83% AFUE $P_{W,SB} \leq 11 \text{ W}$ $P_{W,OFF} \leq 11 \text{ W}$	10 CFR 430 Appendix N
		Non-weatherized mobile home	75% AFUE $P_{W,SB} \leq 11 \text{ W}$ $P_{W,OFF} \leq 11 \text{ W}$	
		Weatherized	78% AFUE	
Electric Furnace	<225,000 Btu/h	All	78% AFUE $P_{W,SB} \leq 10 \text{ W}$ $P_{W,OFF} \leq 10 \text{ W}$	10 CFR 430 Appendix N

<sup>a</sup> Section 12 contains a complete specification of the referenced test procedure.

The 3<sup>rd</sup> Public review ISC makes changes to the SI table 6.8.1-5 clarify the test procedure for Electric Furnaces and to correct the referenced test procedure names

**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**

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure <sup>a</sup>
Warm-air furnace, gas fired for sale applications outside the US <sup>g</sup>	<66 kW	Maximum capacity <sup>c</sup>	80% AFUE non-weatherized or 81% AFUE (weatherized) or 80% $E_t$ <sup>b,d</sup>	DOE 10 CFR Part 430 Appendix N or Section 2.39, Thermal Efficiency, ANSI Z21.47
Warm-air furnace, gas fired	≥66 kW h	Maximum capacity <sup>e</sup>	80% $E_t$ <sup>d</sup> before 1/1/2023 81% $E_t$ <sup>d</sup> after 1/1/2023	Section 2.39, Thermal Efficiency, ANSI Z21.47
Warm-air furnace, oil fired for applications outside the US <sup>g</sup>	<66 kW	Maximum capacity <sup>c</sup>	83% AFUE (non-weatherized) or 78% AFUE (weatherized) Or 80% $E_t$ <sup>b,d</sup>	DOE 10 CFR Part 430 Appendix N or Section 42, Combustion, UL 727
Warm-air furnace, oil fired	≥66 kW	Maximum capacity <sup>c</sup>	81% $E_t$ <sup>b,d</sup> before 1/1/2023 82% $E_t$ <sup>d</sup> after 1/1/2023	Section 42, Combustion, UL 727
Electric Furnaces for applications outside US <sup>g</sup>	<66 kW	all	78% 96% AFUE	DOE 10 CFR Part 430 Appendix N
Warm-air duct furnaces, gas fired	All capacities	Maximum capacity <sup>c</sup>	80% $E_c$ <sup>e</sup>	Section 2.10, Efficiency, ANSI Z83.8
Warm-air unit heaters, gas fired	All capacities	Maximum capacity <sup>c</sup>	80% $E_c$ <sup>e,f</sup>	Section 2.10, Efficiency, ANSI Z83.8
Warm-air unit heaters, oil fired	All capacities	Maximum capacity <sup>c</sup>	80% $E_c$ <sup>e,f</sup>	Section 40, Combustion, UL 731

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

b. Combination units (i.e., furnaces contained within the same cabinet as an air conditioner) not covered by the U.S. Department of Energy Code of Federal Regulations 10 CFR 430 (i.e., three-phase power or with cooling capacity greater than or equal to 65,000 Btu/h) may comply with either rating. All other units <225 kBtu/h sold in the US must meet the AFUE standards for consumer products and test using DOE's AFUE test procedure at 10 CFR 430 Subpart B Appendix N.

c. Compliance of multiple firing rate units shall be at the maximum firing rate.

d.  $E_t$  = thermal efficiency. Units must also include an interrupted or intermittent ignition device (IID), have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.

e.  $E_c$  = combustion efficiency (100% less flue losses). See test procedure for detailed discussion.

f. Units must also include an interrupted or intermittent ignition device (IID) and have either power venting or an automatic flue damper.

g. For US applications of federal covered <225,000 Btu/h products see appendix F table F-4

Make the following modification to SI table F-4 for residential federal covered furnaces as part of the 3<sup>rd</sup> public review ISC

Table F-4 Residential ~~Warm Air~~ Furnaces – Minimum Efficiency Requirements for US applications (see 10 CFR Part 430)

<b>Product Class</b>	<b>Size Category (input)</b>	<b>Subcategory or rating condition</b>	<b>Minimum Efficiency</b>	<b>Test Procedure</b>
Warm air Furnace, gas fired	<66 kW	Non-weatherized excluding mobile home	80% AFUE	10 CFR 430 Appendix N
		Non-weatherized mobile home	80% AFUE	
		Weatherized	81% AFUE	
Warm air furnace oil fired	<66 kW	Non-weatherized excluding mobile home	83% AFUE $P_{W,SB} \leq 11 \text{ W}$ $P_{W,OFF} \leq 11 \text{ W}$	10 CFR 430 Appendix N
		Non-weatherized mobile home	75% AFUE $P_{W,SB} \leq 11 \text{ W}$ $P_{W,OFF} \leq 11 \text{ W}$	
		Weatherized	78% AFUE	
Electric Furnace	<66 kW	All	78% AFUE $P_{W,SB} \leq 10 \text{ W}$ $P_{W,OFF} \leq 10 \text{ W}_F$	10 CFR 430 Appendix N

a. Section 12 contains a complete specification of the referenced test procedure.