



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

**Public Review Draft**

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# **Proposed Addendum BP 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)**

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**ASHRAE, 1791 Tullie Circle, NE, Atlanta GA 30329-2305**

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## FOREWORD

*This addendum adds a new table F-5 to specify DOE covered residential water boiler efficiency requirements similar what was done for other regulated products.*

*In table 6.8.1-6 add notes to indicate that products that fall under the requirements for DOE regulated products the efficiency levels only apply to products applied outside the US.*

*This document is an ISC to the first public review and only the changes made as part of the ISC are open for comment and are shown as changed text. The following is a summary of the changes*

1. Clarified and standardized the wording for US applications and applications outside the US to agree with other 6.8.1 tables
2. Correct the reference to footnote “e” in table F-5 in the IP table
3. Eliminated footnote c and just used footnote b in both the “prior to 1/15/2021” and “after 1/15/2021” columns in table F-5 and then renumbered the other footnotes
4. In Table 6.8.1-6 (both IP and SI versions), footnotes b and c (which define the symbols for thermal efficiency and combustion efficiency) are not referenced anywhere in the table. These were added to the appropriate efficiency metric.
5. The “.86” was missing from the 430 reference in the SI table 6.8.1-6 for  $\geq 88$  kW and these has been corrected to be 430.86
6. Footnote “f” and “g” were deleted from table 6.8.1-6 as they are for residential US products which are now covered by table F-5. They were replace with old footnote h (new footnote f) which refers to section 6.4.1.1.1 which has additional requirements for commercial boilers.
7. Corrected the effective table in table 6.8.1-6 from 3/2/2020 to 2/3/2022 to align with 10 CFR Part §431.87(b) Table 2. This was also in error in the ASHRAE 90.1-2013 and ASHRAE 90.1-2016 standards.

*[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 BP to 90.1-2016

Make the follow modifications to the revised 6.8.1-6 IP and the new table F-5;

**Table 6.8.1-6 Gas- and Oil-Fired Boilers—Minimum Efficiency Requirements**

Equipment Type <sup>a</sup>	Subcategory or Rating Condition	Size Category (Input)	Minimum Efficiency <sup>f</sup>	Efficiency as of 3/2/2020 <sup>g</sup> 2022 <sup>h</sup>	Test Procedure
Boilers, hot water	Gas fired <sup>d</sup>	<300,000 Btu/h <sup>g,i</sup> for applications outside US <sup>g</sup>	82% AFUE	82% AFUE	10 CFR Part 430 Appendix N
		≥300,000 Btu/h and ≤2,500,000 Btu/h <sup>d</sup>	80% E <sub>t</sub> <sup>c</sup>	80% E <sub>t</sub> <sup>c</sup>	10 CFR Part 431.86
	Oil fired <sup>e</sup>	>2,500,000 Btu/h <sup>a</sup>	82% E <sub>c</sub> <sup>b</sup>	82% E <sub>c</sub> <sup>b</sup>	10 CFR Part 430 Appendix N
		<300,000 Btu/h <sup>g</sup> for applications outside US <sup>g</sup>	84% AFUE	84% AFUE	
		≥300,000 Btu/h and ≤2,500,000 Btu/h <sup>d</sup>	82% E <sub>t</sub> <sup>c</sup>	82% E <sub>t</sub> <sup>c</sup>	10 CFR Part 431.86
		>2,500,000 Btu/h <sup>a</sup>	84% E <sub>c</sub> <sup>b</sup>	84% E <sub>c</sub> <sup>b</sup>	
Boilers, steam	Gas fired	<300,000 Btu/h <sup>i</sup> for applications outside US <sup>i</sup>	80% AFUE	80% AFUE	10 CFR Part 430 Appendix N
	Gas fired— all, except natural draft	≥300,000 Btu/h and ≤2,500,000 Btu/h <sup>d</sup>	79% E <sub>t</sub> <sup>c</sup>	79% E <sub>t</sub> <sup>c</sup>	10 CFR Part 431.86
		>2,500,000 Btu/h <sup>a</sup>	79% E <sub>t</sub> <sup>c</sup>	79% E <sub>t</sub> <sup>c</sup>	
	Gas fired— natural draft	≥300,000 Btu/h and ≤2,500,000 Btu/h <sup>d</sup>	77% E <sub>t</sub> <sup>c</sup>	79% E <sub>t</sub> <sup>c</sup>	
		>2,500,000 Btu/h <sup>a</sup>	77% E <sub>t</sub> <sup>c</sup>	79% E <sub>t</sub> <sup>c</sup>	
	Oil fired <sup>e</sup>	<300,000 Btu/h <sup>i</sup> for applications outside US <sup>i</sup>	82% AFUE	82% AFUE	10 CFR Part 430 Appendix N
		≥300,000 Btu/h and ≤2,500,000 Btu/h <sup>d</sup>	81% E <sub>t</sub> <sup>c</sup>	81% E <sub>t</sub> <sup>c</sup>	10 CFR Part 431.86
		>2,500,000 Btu/h <sup>a</sup>	81% E <sub>t</sub> <sup>c</sup>	81% E <sub>t</sub> <sup>c</sup>	

a. These requirements apply to *boilers* with rated input of 8,000,000 Btu/h or less that are not packaged *boilers* and to all packaged *boilers*. Minimum *efficiency* requirements for *boilers* cover all capacities of packaged *boilers*.

b. E<sub>c</sub> = combustion *efficiency* (100% less flue losses). See reference document for detailed information.

c. E<sub>t</sub> = thermal *efficiency*. See reference document for detailed information.

d. Maximum capacity—minimum and maximum ratings as provided for and allowed by the unit's *controls*.

e. Includes oil-fired (residual).

f. *Boilers* shall not be equipped with a constant burning pilot light.

g. A *boiler* not equipped with a tankless domestic water heating coil shall be equipped with an *automatic* means for adjusting the temperature of the water such that an incremental change in inferred heat load produces a corresponding incremental change in the temperature of the water supplied.

h. For new construction refer to Section 6.4.1.1.1 for additional system compliance requirements.

i. See appendix F table F-4 for US minimum efficiencies for residential products covered by DOE requirements for US applications

Make the following modifications to the new IP table F-5

Table F-5 Residential Boiler<sup>a</sup> Minimum Efficiency Requirements for ~~applications in the US~~ applications in the US (Refer to 10 CFR 430)

Product Class	Minimum Efficiency prior to January 15, 2021 <sup>b</sup>	Minimum Efficiency as of January 15, 2021 <sup>eb</sup>	Standby Mode and Off Mode Power Consumption as of January 15, 2021 <sup>dc</sup>	Design Requirements
Gas Fired hot water boiler	82% AFUE	84% AFUE	$P_{W,SB} \leq 9 \text{ W}$ $P_{W,OFF} \leq 9 \text{ W}$	Constant burning pilot not permitted. Automatic means for adjusting water temperature required (except for boilers equipped with tankless domestic water heating coils) <sup>d</sup> .
Gas-Fired steam boiler	80% AFUE	82% AFUE	$P_{W,SB} \leq 8 \text{ W}$ $P_{W,OFF} \leq 8 \text{ W}$	Constant burning pilot not permitted.
Oil-fired hot water boiler	84% AFUE	86% AFUE	$P_{W,SB} \leq 11 \text{ W}$ $P_{W,OFF} \leq 11 \text{ W}$	Automatic means for adjusting temperature required (except for boilers equipped with tankless domestic water heating coils) <sup>d</sup> .
Oil-fired steam boiler	82% AFUE	85% AFUE	$P_{W,SB} \leq 11 \text{ W}$ $P_{W,OFF} \leq 11 \text{ W}$	None
Electric hot water boiler	none	none	$P_{W,SB} \leq 8 \text{ W}$ $P_{W,OFF} \leq 8 \text{ W}$	Automatic means for adjusting temperature required (except for boilers equipped with tankless domestic water heating coils) <sup>d</sup> .
Electric steam boiler	none	none	$P_{W,SB} \leq 8 \text{ W}$ $P_{W,OFF} \leq 8 \text{ W}$	None

<sup>a</sup> Has a heat input rate of less than 300,000 Btu per hour for electric boilers and low-pressure steam or hot water boilers (per § 430.2)

<sup>b</sup> Annual Fuel Utilization Efficiency, as determined in § 430.23(n)(2)

<sup>e</sup> ~~Annual Fuel Utilization Efficiency, as determined in § 430.23(n)(2)~~

<sup>dc</sup> Standby mode and off mode electric power consumption as determined in § 430.23(n)(5)

<sup>ed</sup> See § 430.32(e)(2)(iv) for additional details regarding automatic means for adjusting water temperature.

Make the following modifications to table 6.8.1-6 SI and to the new table F-5;

**Table 6.8.1-6 Gas- and Oil-Fired Boilers—Minimum Efficiency Requirements**

<b>Equipment Type<sup>a</sup></b>	<b>Subcategory or Rating Condition</b>	<b>Size Category (Input)</b>	<b>Minimum Efficiency<sup>f</sup></b>	<b>Efficiency as of 3/2/2020<sup>g</sup>2022<sup>f</sup></b>	<b>Test Procedure</b>	
<i>Boilers, hot water</i>	Gas fired <sup>h</sup>	<88 kW <sup>f,g,i</sup> for applications outside US <sup>g</sup>	82% AFUE	82% AFUE	10 CFR Part 430 Appendix N	
		≥88 kW and ≤733 kW <sup>d</sup>	80% E <sub>t</sub> <sup>c</sup>	80% E <sub>t</sub> <sup>c</sup>	10 CFR Part 431.86	
		>733 kW <sup>a</sup>	82% E <sub>c</sub> <sup>b</sup>	82% E <sub>c</sub> <sup>b</sup>		
	Oil fired <sup>e</sup>	<88 kW <sup>g</sup> for applications outside US <sup>g</sup>	84% AFUE	84% AFUE	10 CFR Part 430 Appendix N	
		≥88 kW and ≤733 kW <sup>d</sup>	82% E <sub>t</sub> <sup>c</sup>	82% E <sub>t</sub> <sup>c</sup>	10 CFR Part 431.86	
		>733 kW <sup>a</sup>	84% E <sub>c</sub> <sup>b</sup>	84% E <sub>c</sub> <sup>b</sup>		
<i>Boilers, steam</i>	Gas fired	<88 kW <sup>f,i</sup> for applications outside US <sup>g</sup>	80% AFUE	80% AFUE	10 CFR Part 430 Appendix N	
		Gas fired— all, except natural draft	≥88 kW and ≤733 kW <sup>d</sup>	79% E <sub>t</sub> <sup>c</sup>	79% E <sub>t</sub> <sup>c</sup>	10 CFR Part 431.86
			>733 kW <sup>a</sup>	79% E <sub>t</sub> <sup>c</sup>	79% E <sub>t</sub> <sup>c</sup>	
	Gas fired— natural draft	≥88 kW and ≤733 kW <sup>d</sup>	77% E <sub>t</sub> <sup>c</sup>	79% E <sub>t</sub> <sup>c</sup>	10 CFR Part 431.86	
		>733 kW <sup>a</sup>	77% E <sub>t</sub> <sup>c</sup>	79% E <sub>t</sub> <sup>c</sup>		
	Oil fired <sup>e</sup>	<88 kW <sup>i</sup> for applications outside US <sup>g</sup>	82% AFUE	82% AFUE	10 CFR Part 430 Appendix N	
		≥88 kW and ≤733 kW <sup>d</sup>	81% E <sub>t</sub> <sup>c</sup>	81% E <sub>t</sub> <sup>c</sup>	10 CFR Part 431.86	
			>733 kW <sup>a</sup>	81% E <sub>t</sub> <sup>c</sup>		81% E <sub>t</sub> <sup>c</sup>

a. These requirements apply to *boilers* with rated input of 2346 kW or less that are not packaged *boilers* and to all packaged *boilers*. Minimum *efficiency* requirements for *boilers* cover all capacities of packaged *boilers*.

b. E<sub>c</sub> = combustion *efficiency* (100% less flue losses). See reference document for detailed information.

c. E<sub>t</sub> = thermal *efficiency*. See reference document for detailed information.

d. Maximum capacity—minimum and maximum ratings as provided for and allowed by the unit's *controls*.

e. Includes oil-fired (residual).

f. ~~Boilers shall not be equipped with a constant burning pilot light.~~

g. ~~A boiler not equipped with a tankless domestic water heating coil shall be equipped with an automatic means for adjusting the temperature of the water such that an incremental change in inferred heat load produces a corresponding incremental change in the temperature of the water supplied.~~

h. For new construction refer to Section 6.4.1.1.1 for additional system compliance requirements.

i. See appendix F table F-4 for US minimum efficiencies for residential products covered by DOE requirements for US applications

*Make the following modifications to new table F-5 SI*

**Table F-5 Residential Boiler<sup>a</sup> Minimum Efficiency Requirements for applications in the US applications**  
(Refer 10 CFR Part 430)

Product Class	Minimum Efficiency prior to January 15, 2021 <sup>b</sup>	Minimum Efficiency as of January 15, 2021 <sup>eb</sup>	Standby Mode and Off Mode Power Consumption as of January 15, 2021 <sup>d</sup>	Design Requirements <sup>e</sup>
Gas Fired hot water boiler	82% AFUE	84% AFUE	$P_{W,SB} \leq 9 \text{ W}$ $P_{W,OFF} \leq 9 \text{ W}$	Constant burning pilot not permitted. Automatic means for adjusting water temperature required (except for boilers equipped with tankless domestic water heating coils). <sup>e</sup>
Gas-Fired steam boiler	80% AFUE	82% AFUE	$P_{W,SB} \leq 8 \text{ W}$ $P_{W,OFF} \leq 8 \text{ W}$	Constant burning pilot not permitted.
Oil-fired hot water boiler	84% AFUE	86% AFUE	$P_{W,SB} \leq 11 \text{ W}$ $P_{W,OFF} \leq 11 \text{ W}$	Automatic means for adjusting temperature required (except for boilers equipped with tankless domestic water heating coils). <sup>e</sup>
Oil-fired steam boiler	82% AFUE	85% AFUE	$P_{W,SB} \leq 11 \text{ W}$ $P_{W,OFF} \leq 11 \text{ W}$	None
Electric hot water boiler	none	none	$P_{W,SB} \leq 8 \text{ W}$ $P_{W,OFF} \leq 8 \text{ W}$	Automatic means for adjusting temperature required (except for boilers equipped with tankless domestic water heating coils). <sup>ed</sup>
Electric steam boiler	none	none	$P_{W,SB} \leq 8 \text{ W}$ $P_{W,OFF} \leq 8 \text{ W}$	None

<sup>a</sup> Has a heat input rate of less than 88 kW for electric boilers and low-pressure steam or hot water boilers (per § 430.2)

<sup>b</sup> Annual Fuel Utilization Efficiency, as determined in § 430.23(n)(2)

<sup>e</sup> Annual Fuel Utilization Efficiency, as determined in § 430.23(n)(2)

<sup>dc</sup> Standby mode and off mode electric power consumption as determined in § 430.23(n)(5)

<sup>ed</sup> See § 430.32(e)(2)(iv) for additional details regarding automatic means for adjusting water temperature.