BSR/ASHRAE/IES Addendum cj
to ANSI/ASHRAE/IES Standard 90.1-2022

Public Review Draft

Proposed Addendum cj to Standard 90.1-2022, Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings

First Public Review (March 2025)
(Draft Shows Proposed Changes to Current Standard)

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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

The ASHRAE 90.1-2022 standard include energy efficiency requirements for residential products that are defined directly by DOE in the U.S. Code of Federal Regulations, 10 CFR 430. Although ASHRAE 90.1 does not have responsibility to define efficiency requirements for residential products sold in the U.S. they are still used in commercial buildings and have been included in ASHRAE 90.1 requirements in informative appendix F. The residential product requirements are also duplicated in section 6 and 7 for products sold outside the US where DOE does not control.

The efficiency requirements for residential products are directly defined by DOE per the authorization defined in the National Appliance Energy Conservation Act (NAECA) and are subject to preemption. The ASHRAE 90.1 standard for completeness and easy use of the standard has included the U.S residential product efficiencies with the understanding that if DOE revised the requirements, then DOE requirements would preempt what is included in ASHRAE 90.1. Typically, DOE allows three or more years for implementation and with the ASHRAE 90.1 update schedule every three years the requirements can stay aligned.

The SSPC 90.1 MSC subcommittee reviewed with DOE the current practice of separating DOE controlled residential product efficiencies in an informative appendix and concluded that separation of residential and outside U.S. residential and commercial product requirements is not needed. Therefore, the appendix F tables and section 6 and 7 can be combined which will simplify the standard and make it easier to use. It should be noted that DOE requirements are already duplicated in section 6 and 7 for products sold outside the U.S. With all the requirements in one location AHJ's and other users will see the requirements for a given product in one common table. We also have reformatted some of the information to group common products together.

Some addenda have already been developed to integrate the DOE residential product requirements in section 6.

- ***Addendum BQ** was approved by the SSPC to update the room air conditioners requirements which are controlled by DOE and documented in table F-3. Outside U.S. requirements are also defined in table 6.8.1-4. Addendum BQ merged the requirements for U.S. and outside U.S. into one common new table 6.8.1-22. This addendum was released for public review from Nov 29, 2024, to January 6, 2025. The addendum did not delete table F-3 and this addendum will delete table F-3.*

- ***Addendum BE** was developed to move the requirements in table F-1 for U.S application single-phase air conditioners and heat pumps from appendix F and combine with tables 6.8.1-1 and 6.8.1-2 along with other commercial equipment changes and result of new metrics and negotiated ASRAC rules. Addendum BE was approved by the SSPC 90.1 committee and is released for public review from Jan 3, 2025, to February 17, 2025.*

This addendum will make the following additional changes;

- *Overall, this addendum is intended to reformat and reorganize the table but there are a few DOE efficiency updates for pool heaters and for boilers that will be included in this addendum to align with recent DOE requirements. We also updated some of the footnotes to clarify and align between section 6, 7 and appendix F.*

- *Delete all of appendix F requirements and tables and replace with combined tables in section 6 and 7. Appendix F will be total eliminated but will be reserved for future use. The elimination of appendix F also impacts other sections and this addendum also address where references to appendix F need to be corrected.*

- *Make some formatting and editorial changes to sections 6.4.1.1 and 6.4.1.2.1 including some marking requirements for chiller efficiency compliance. For ease of use we also converted the long list of prescriptive efficiency tables to a master table and also added some notes as to which are covered by preemption which is a common question from users of the standard.*

- *Move the requirements in table F-2 defining the Minimum Energy Efficiency Requirements for Water Heaters and Pool Heaters from appendix F and combine with 7.4.1, so that all residential and commercial water heaters are in one table. Some changes have been made to water heating efficiency requirements to align with recently DOE final rules for water heating equipment.*

- *The minimum efficiencies for room air conditions defined in table F-3 were addressed by addendum BQ where the requirements were updated in a new table 6.8.1-22 which covers both U.S. and outside U.S. requirements. But addendum BQ did not delete table F-3 which will be handled by this addendum. Note the efficiencies in table F-3 are out of date and addendum BQ made changes to table 6.8.1-22 efficiency requirements to align them a recent DOE final rule.*

- *Move the requirements in Table F-4 for Residential Furnaces Minimum Efficiency Requirements for the US applications and combine with table 6.8.1-5, so that all residential and commercial furnace efficiency requirements are in one table. Some changes have been made to align with recent DOE final rules. Some changes were made to formatting and footnotes to improve clarity and easy of use.*

- *Move the requirements in table F-5 for U.S. Residential Boiler Minimum Efficiency requirements and combine with table 6.8.1-6, so that all residential and commercial boiler efficiency requirements are in one table. Some changes have been made to align with recent DOE final rules. Some changes were made to formatting and footnotes to improve clarity and easy of use.*

- *Move the requirements in table F-6 for Ceiling Fan Efficiency Requirements for U.S. Applications and combine with the commercial requirements in table 6.8.1-21. No changes have been made to efficiency requirements. Some editorial changes will be made to improve the use of the tables. No efficiency requirements have been made.*

Some references used in the tables have changed but these will be handled in a separate general addendum to update references which we typically wait to the end of the 3-year cycle to make sure we have the latest changes.

For most of the addendum there are no changes to the efficiency requirements therefore there is no economic justification needed. For the DOE controlled efficiency requirement changes, the economic justification is available in the DOE documentation. The primary purpose of this addendum is improving

the useability of the standard and make a few corrections to align with DOE controlled efficiency requirements.

[Note to Reviewers: This addendum makes proposed changes to the current standard. 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 current standard 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 changes.]

Addendum cj to 90.1-2022

This is a large addendum and involves 6 changes to the standard. Each will be presented including IP and SI tables and requirements.

Change 1. Delete appendix F requirements and tables and references to appendix F. The appendix will be reserved for future use.

Change 2. Revisions to section 6.4.1.1, covering general requirements for minimum equipment efficiencies, to including making the list of efficiency tables into a master-able. Also make a change to align the requirements for chiller label requirements with other products.

Change 3. Table F-2 covering minimum energy efficiency requirements for residential water heaters and pool heaters has been combined with table 7.4.1 covering performance requirements for water-heating commercial and and combined into one common table. There are also some new residential water heater requirements effective 5/6/2029 and new commercial requirements effective 10/1/2026 that have been added to align requirements with DOE final rules. Footnotes have also been revised to align and clarify Appendix F and section 7 footnotes.

Change 4. Combine Table F-4 covering residential furnaces with table 6.8.1-5 covering commercial and non-U.S. warm-air furnaces into one common table 6.8.1-5. We also have included some new DOE defined efficiencies that have been released in final rules along with some updates to footnotes and table structure to improve clarity and useability.

Change 5. Combine table F-5 covering residential boiler minimum efficiency requirements for U.S. applications with and table 6.8.1-6 covering commercial and non-U.S. gas and oil-fired boilers into one common table 6.8.1-6. In addition to the combination of the table we also have included updates in DOE covered efficiencies that were part of a final rule. Some editorial changes have been made to the tables and footnotes to improve clarity and useability of the table.

Change 6. Combine table F-6 covering ceiling fan efficiency requirements for U.S. applications with table 6.8.1-21 covering commercial ceiling fan efficiency requirements into a new table 6.8.1-21. The requirements are the same in both tables and will just be combined into one common table with some clarification in the footnotes.

Change 1
Delete Appendix F which is an informative appendix covering DOE residential efficiency requirements. Also update references to appendix F in section 11

Delete all of appendix F for the I-P and SI including all text and tables F1, F2, F3, F4, F5, and F6. The IP appendix is included below for reference. The requirements and table contents will be moved to section 6 and 7.

Note addendum BQ addressed the requirements in table F-3 Minimum Efficiency Requirements for Room Air Conditioners for U.S. Applications but did not delete table F-3.

Also note addendum BE proposes to delete table F-1 and add the requirements to table 6.8.1-1 and 6.8.1-2 but table F-1 is included below for completeness, but this addendum is contingent on the publication of addendum AE.

~~**This appendix 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.)**~~

~~INFORMATIVE APPENDIX F~~
~~U.S. DEPARTMENT OF ENERGY MINIMUM ENERGY EFFICIENCY REQUIREMENTS, TEST PROCEDURES, AND DEFINITIONS~~

~~In the United States, the U.S. Department of Energy (U.S. DOE) establishes *efficiency* standards for products that it defines as "residential covered products." Since these products are used in *buildings* covered by this standard, U.S. DOE *efficiency* requirements are shown here for convenience. All U.S. DOE *efficiency* requirements for *residential* products are found in the U.S. *Code of Federal Regulations*, 10 CFR 430.32.~~
~~DOE also establishes definitions and test procedures for covered products. These are found in 10 CFR 430.2 and 10 CFR 430.23, respectively.~~

~~F1. U.S. DOE MINIMUM ENERGY EFFICIENCY REQUIREMENTS FOR SINGLE-PHASE AIR CONDITIONERS AND HEAT PUMPS~~

~~These standards became effective on January 1, 2015. In the United States, some of the standards are regional in nature. The U.S. has been divided into 3 regions: (a) the north, comprising states with a population weighted heating *degree days* (HDD) equal to or greater than 5000; (b) the southeast, comprising states with a population weighted HDD less than 5000; and (c) the southwest, comprising Arizona, California, Nevada, and New Mexico. The regions are shown in Figure F-1.~~

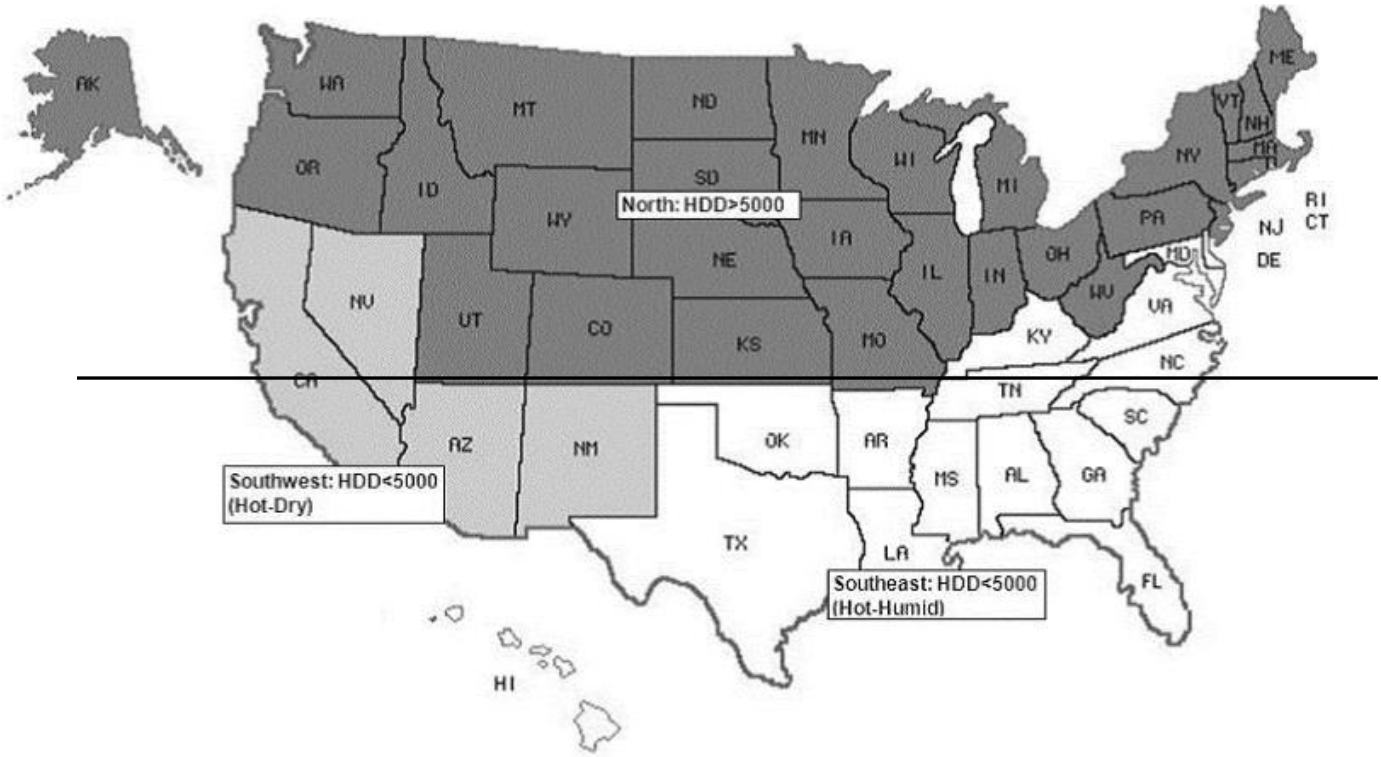
~~The U.S. federal minimum *energy efficiency* standards for single-phase air conditioners and heat pumps are shown in Table F-1. The standards apply to *residential* single-phase air conditioners and heat pumps that are rated at less than 65,000 Btu/h of cooling capacity.~~

~~F2. U.S. DOE MINIMUM ENERGY EFFICIENCY REQUIREMENTS FOR WATER HEATERS AND POOL HEATERS~~

~~These standards for Uniform Energy Factor became effective on December 29, 2017, and apply to products manufactured on or after that date and the thermal *efficiency* requirements for gas fired *pool* heaters manufactured on or after April 16, 2013 (Table F-2).~~

~~F3. U.S. DOE TEST PROCEDURE AND DEFINITIONS FOR CEILING FANS~~

~~U.S. DOE definitions for *ceiling fans* are found in 10 CFR 430.2 and 10 CFR Part 430, Subpart B, Appen- dix U. On or after January 23, 2017, *manufacturers* of *ceiling fans* must make any representations with respect to *energy* use or *efficiency* in accordance with the test procedure in 10 CFR Part 430, Subpart B, Appendix U. DOE also specifies, in 10 CFR 430.32, design requirements for *ceiling fans*, and for *ceiling fans* manufactured on or after January 21, 2020, minimum *efficiency* requirements~~.



~~Figure F-1 Map of the regions for the analysis of central air conditioners and heat pumps.~~
(Source: *~~Federal Register~~* 76 FR 37431, June 7, 2018)

~~Table F-1 Minimum Efficiency Requirements for Single-Phase Central Air Conditioners and Heat Pumps for Applications in the U.S.~~

~~Product Class~~	~~Capacity Range~~	~~National Standards~~	~~Southeastern Region Standards[a]~~	~~Southwestern Region Standards[b]~~	~~Test Procedure[f]~~
~~Central Air Conditioners and Heat Pumps[c]~~					
~~Split-system air conditioners for U.S. applications~~	~~<45,000 Btu/h *single phase*~~	~~*SEER* = 13.0 $P_{W,OFF} \leq 30$ W before 1/1/2023 *SEER2* = 13.4 $P_{W,OFF} \leq 30$ W after 1/1/2023~~	~~*SEER* = 14.0 $P_{W,OFF} \leq 30$ W before 1/1/2023 *SEER2* = 14.3 $P_{W,OFF} \leq 30$ W after 1/1/2023~~	~~*SEER* = 14.0 *EER* = 12.2 $P_{W,OFF} \leq 30$ W before 1/1/2023 *SEER2* = 14.3 *EER2* = 11.7/9.8[d] $P_{W,OFF} \leq 30$ W after 1/1/2023~~	~~AHRI 210/240-2017 before 1/1/2023 AHRI 210/240-2023 after 1/1/2023~~
~~Split-system air conditioners~~	~~≥45,000 Btu/h and <65,000 Btu/h *single phase*~~	~~*SEER* = 13.0 $P_{W,OFF} \leq 30$ W before 1/1/2023 *SEER2* = 13.4 $P_{W,OFF} \leq 30$ W after 1/1/2023~~	~~*SEER* = 14.0 $P_{W,OFF} \leq 30$ W before 1/1/2023 *SEER2* = 13.8 $P_{W,OFF} \leq 30$ W after 1/1/2023~~	~~*SEER* = 14.0 *EER* = 11.7[d] $P_{W,OFF} \leq 30$ W before 1/1/2023 *SEER2* = 13.8 *EER2* = 11.2/9.8[e] $P_{W,OFF} \leq 30$ W after 1/1/2023~~	~~AHRI 210/240-2017 before 1/1/2023 AHRI 210/240-2023 after 1/1/2023~~

~~a. The Southeastern region for central air conditioners and heat pumps contains the following States: Alabama, Arkansas, Delaware, Florida, Georgia, Hawaii, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia, and the District of Columbia.~~

~~b. The Southwestern region for central air conditioners contains the States of Arizona, California, Nevada, and New Mexico.~~

~~c. *SEER* is *seasonal energy efficiency ratio*; *EER* is *energy efficiency ratio*; *HSPF* is *heating seasonal performance factor*; and Btu/h is British thermal units per hour. *SEER2* is *seasonal energy efficiency ratio* reflecting the new higher static that is effective 1/1/2023; *EER2* is *energy efficiency ratio* also reflecting the higher static; and *HSPF2* is new *heating seasonal performance factor* reflecting the new higher static and load line. Test and rating procedure defined in AHRI 210/240-2017 for *EER*, *SEER*, and *HSPF* and AHRI 210/240-2023 for *EER2*, *SEER2*, and *HSPF2*. The added "2" in the metric names reflects the new higher static (all metrics) and load line (*HSPF2* only) for the new metrics effective 1/1/2023.~~

~~d. The 11.7 *EER2* standard applies to products with a certified *SEER2* less than 15.2. The 9.8 *EER2* standard applies to products with a certified *SEER2* greater than or equal to 15.2.~~

~~e. The 11.2 *EER2* standard applies to products with a certified *SEER2* less than 15.2. The 9.8 *EER2* standard applies to products with a certified *SEER2* greater than or equal to 15.2.~~

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

Table F-1 Minimum Efficiency Requirements for Single-Phase Central Air Conditioners and Heat Pumps for Applications in the U.S.

Product Class	Capacity Range	National Standards	Southeastern Region Standards[a]	Southwestern Region Standards[b]	Test Procedure[f]
Central Air Conditioners and Heat Pumps[e]					
Split-system heat pumps	<65,000 Btu/h *single phase*	*SEER* = 14.0 *HSPF* = 8.2 $P_{W,OFF}$ ≤ 33 W before 1/1/2023 *SEER2* = 14.3 *HSPF2* = 7.5 $P_{W,OFF}$ ≤ 33 W after 1/1/2023	*SEER* = 14.0 *HSPF* = 8.2 $P_{W,OFF}$ ≤ 33 W before 1/1/2023 *SEER2* = 14.3 *HSPF2* = 7.5 $P_{W,OFF}$ ≤ 33 W after 1/1/2023	*SEER* = 14.0 *HSPF* = 8.2 $P_{W,OFF}$ ≤ 33 W before 1/1/2023 *SEER2* = 14.3 *HSPF2* = 7.5 $P_{W,OFF}$ ≤ 33 W after 1/1/2023	AHRI 210/240-2017 before 1/1/2023 AHRI 210/240-2023 after 1/1/2023
Single-package air conditioners	<65,000 Btu/h *single phase*	*SEER* = 14.0 $P_{W,OFF}$ ≤ 30 W before 1/1/2023 *SEER2* = 13.4 $P_{W,OFF}$ ≤ 30 W after 1/1/2023	*SEER* = 14.0 $P_{W,OFF}$ ≤ 30 W before 1/1/2023 *SEER2* = 13.4 $P_{W,OFF}$ ≤ 30 W after 1/1/2023	*SEER* = 14.0 *EER* = 11.0 $P_{W,OFF}$ ≤ 30 W before 1/1/2023 *SEER2* = 13.4 *EER2* = 10.6 $P_{W,OFF}$ ≤ 30 W after 1/1/2023	AHRI 210/240-2017 before 1/1/2023 AHRI 210/240-2023 after 1/1/2023
Single-package heat pumps	<65,000 Btu/h *single phase*	*SEER* = 14.0 *HSPF* = 8.0 $P_{W,OFF}$ ≤ 33 W before 1/1/2023 *SEER2* = 13.4 *HSPF2* = 6.7 $P_{W,OFF}$ ≤ 33 W after 1/1/2023	*SEER* = 14.0 *HSPF* = 8.0 $P_{W,OFF}$ ≤ 33 W before 1/1/2023 *SEER2* = 13.4 *HSPF2* = 6.7 $P_{W,OFF}$ ≤ 33 W after 1/1/2023	*SEER* = 14.0 *HSPF* = 8.0 $P_{W,OFF}$ ≤ 33 W before 1/1/2023 *SEER2* = 13.4 *HSPF2* = 6.7 $P_{W,OFF}$ ≤ 33 W after 1/1/2023	AHRI 210/240-2017 before 1/1/2023 AHRI 210/240-2023 after 1/1/2023
Small-duct high-velocity *systems*	<65,000 Btu/h *single phase*	*SEER* = 12.0 *HSPF* = 7.2 $P_{W,OFF}$ ≤ 30 W before 1/1/2023 *SEER2* = 12.0 *HSPF2* = 6.1 $P_{W,OFF}$ ≤ 30 W after 1/1/2023	*SEER* = 12.0 *HSPF* = 7.2 $P_{W,OFF}$ ≤ 30 W before 1/1/2023 *SEER2* = 12.0 *HSPF2* = 6.1 $P_{W,OFF}$ ≤ 30 W after 1/1/2023	*SEER* = 12.0 *HSPF* = 7.2 $P_{W,OFF}$ ≤ 30 W before 1/1/2023 *SEER2* = 12.0 *HSPF2* = 6.1 $P_{W,OFF}$ ≤ 30 W after 1/1/2023	AHRI 210/240-2017 before 1/1/2023 AHRI 210/240-2023 after 1/1/2023
Space-constrained products— air conditioners [a]	<65,000 Btu/h *single phase*	*SEER* = 12.0 $P_{W,OFF}$ ≤ 30 W before 1/1/2023 *SEER2* = 11.7 $P_{W,OFF}$ ≤ 30 W after 1/1/2023	*SEER* = 12.0 $P_{W,OFF}$ ≤ 30 W before 1/1/2023 *SEER2* = 11.7 $P_{W,OFF}$ ≤ 30 W after 1/1/2023	*SEER* = 12.0 $P_{W,OFF}$ ≤ 30 W before 1/1/2023 *SEER2* = 11.7 $P_{W,OFF}$ ≤ 30 W after 1/1/2023	AHRI 210/240-2017 before 1/1/2023 AHRI 210/240-2023 after 1/1/2023
Space-constrained products— heat pumps [a]	<65,000 Btu/h *single phase*	*SEER* = 12.0 *HSPF* = 7.4 $P_{W,OFF}$ ≤ 33 W before 1/1/2023 *SEER2* = 11.9 *HSPF2* = 6.3 $P_{W,OFF}$ ≤ 33 W after 1/1/2023	*SEER* = 12.0 *HSPF* = 7.4 $P_{W,OFF}$ ≤ 33 W before 1/1/2023 *SEER2* = 11.9 *HSPF2* = 6.3 $P_{W,OFF}$ ≤ 33 W after 1/1/2023	*SEER* = 12.0 *HSPF* = 7.4 $P_{W,OFF}$ ≤ 33 W before 1/1/2023 *SEER2* = 11.9 *HSPF2* = 6.3 $P_{W,OFF}$ ≤ 33 W after 1/1/2023	AHRI 210/240-2017 before 1/1/2023 AHRI 210/240-2023 after 1/1/2023

a. The Southeastern region for central air conditioners and heat pumps contains the following States: Alabama, Arkansas, Delaware, Florida, Georgia, Hawaii, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia, and the District of Columbia.

b. The Southwestern region for central air conditioners contains the States of Arizona, California, Nevada, and New Mexico.

c. *SEER* is *seasonal energy efficiency ratio*; *EER* is *energy efficiency ratio*; *HSPF* is *heating seasonal performance factor*; and Btu/h is British thermal units per hour. *SEER2* is *seasonal energy efficiency ratio* reflecting the new higher static that is effective 1/1/2023; *EER2* is *energy efficiency ratio* also reflecting the higher static; and *HSPF2* is new *heating seasonal performance factor* reflecting the new higher static and load line. Test and rating procedure defined in AHRI 210/240-2017 for *EER*, *SEER*, and *HSPF* and AHRI 210/240-2023 for *EER2*, *SEER2*, and *HSPF2*. The added "2" in the metric names reflects the new higher static (all metrics) and load line (*HSPF2* only) for the new metrics effective 1/1/2023.

d. The 11.7 *EER2* standard applies to products with a certified *SEER2* less than 15.2. The 9.8 *EER2* standard applies to products with a certified *SEER2* greater than or equal to 15.2.

e. The 11.2 *EER2* standard applies to products with a certified *SEER2* less than 15.2. The 9.8 *EER2* standard applies to products with a certified *SEER2* greater than or equal to 15.2.

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

Table F-2 Minimum Energy Efficiency Requirements for Water Heaters and Pool Heaters
Source: 10 CFR Part 430, Energy Conservation Program: Energy Conservation Standards for Water Heaters

Product Class	Rated Storage Volume and input Rating (if applicable)	Draw Pattern	Uniform Energy Factor (UEF) or Thermal Efficiency (E_t)	Test Procedure
Gas-fired storage water heater	≥20 gal and ≤55 gal	Very small	UEF = 0.3456 − (0.0020 × V_r)	10 CFR 430 Appendix E
		Low	UEF = 0.5982 − (0.0019 × V_r)	
		Medium	UEF = 0.6483 − (0.0017 × V_r)	
		High	UEF = 0.6920 − (0.0013 × V_r)	
	>55 gal and ≤100 gal	Very small	UEF = 0.6470 − (0.0006 × V_r)	10 CFR 430 Appendix E
		Low	UEF = 0.7689 − (0.0005 × V_r)	
		Medium	UEF = 0.7897 − (0.0004 × V_r)	
		High	UEF = 0.8072 − (0.0003 × V_r)	
Oil-fired storage water heater	≤50 gal	Very small	UEF = 0.2509 − (0.0012 × V_r)	10 CFR 430 Appendix E
		Low	UEF = 0.5330 − (0.0016 × V_r)	
		Medium	UEF = 0.6078 − (0.0016 × V_r)	
		High	UEF = 0.6815 − (0.0014 × V_r)	
Electric storage water heaters	≥20 gal and ≤55 gal	Very small	UEF = 0.8808 − (0.0008 × V_r)	10 CFR 430 Appendix E
		Low	UEF = 0.9254 − (0.0003 × V_r)	
		Medium	UEF = 0.9307 − (0.0002 × V_r)	
		High	UEF = 0.9349 − (0.0001 × V_r)	
	>55 gal and ≤120 gal	Very small	UEF = 1.9236 − (0.0011 × V_r)	10 CFR 430 Appendix E
		Low	UEF = 2.0440 − (0.0011 × V_r)	
		Medium	UEF = 2.1171 − (0.0011 × V_r)	
		High	UEF = 2.2418 − (0.0011 × V_r)	
Tabletop water heater	≥20 gal and ≤120 gal	Very small	UEF = 0.6323 − (0.0058 × V_r)	10 CFR 430 Appendix E
		Low	UEF = 0.9188 − (0.0031 × V_r)	
		Medium	UEF = 0.9577 − (0.0023 × V_r)	
		High	UEF = 0.9884 − (0.0016 × V_r)	
Instantaneous gas-fired water heater	<2 gal and >50,000 Btu/h	Very small	UEF = 0.80	10 CFR 430 Appendix E
		Low	UEF = 0.81	
		Medium	UEF = 0.81	
		High	UEF = 0.81	
Instantaneous electric water heater	<2 gal	Very small	UEF = 0.91	10 CFR 430 Appendix E
		Low	UEF = 0.91	
		Medium	UEF = 0.91	
		High	UEF = 0.92	
Grid-enabled water heaters	>75 gal	Very small	UEF = 1.0136 − (0.0028 × V_r)	10 CFR 430 Appendix E
		Low	UEF = 0.9984 − (0.0014 × V_r)	
		Medium	UEF = 0.9853 − (0.0010 × V_r)	
		High	UEF = 0.9720 − (0.0007 × V_r)	
Pool heater gas			82% E_t	10 CFR 430 Appendix P

a. V_r is the rated storage volume (in gallons), as determined pursuant to 10 CFR 429.17.
b. Standards for electric storage water heaters apply to both *electric resistance* water heaters and heat pump water heaters.

Table F-3 Minimum Efficiency Requirements for Room Air Conditioners for U.S. Applications

Product Class	Capacity Range	Efficiency Requirements[a]	Test Procedure[b]
Room air conditioners without reverse cycle with louvered sides	<6,000 Btu/h	*CEER* = 11.0	10 CFR 430 Appendix F
	≥6,000 Btu/h and <8,000 Btu/h	*CEER* = 11.0	
	≥8,000 Btu/h and <14,000 Btu/h	*CEER* = 10.9	
	≥14,000 Btu/h and <20,000 Btu/h	*CEER* = 10.7	
	≥20,000 Btu/h and <28,000 Btu/h	*CEER* = 9.4	
	≥28,000 Btu/h	*CEER* = 9.0	
Room air conditioners without reverse cycle without louvered sides	<6,000 Btu/h	*CEER* = 10.0	10 CFR 430 Appendix F
	≥6,000 Btu/h and <8,000 Btu/h	*CEER* = 10.0	
	≥8,000 Btu/h and <11,000 Btu/h	*CEER* = 9.6	
	≥11,000 Btu/h and <14,000 Btu/h	*CEER* = 9.5	
	≥14,000 Btu/h and <20,000 Btu/h	*CEER* = 9.3	
	≥20,000 Btu/h	*CEER* = 9.4	
Room air conditioners with reverse cycle with louvered sides	<20,000 Btu/h	*CEER* = 9.8	10 CFR 430 Appendix F
	≥20,000 Btu/h	*CEER* = 9.3	
Room air conditioners with reverse cycle without louvered sides	<14,000 Btu/h	*CEER* = 9.3	10 CFR 430 Appendix F
	≥14,000 Btu/h	*CEER* = 8.7	
Room air conditioners, casement only	All	*CEER* = 9.5	10 CFR 430 Appendix F
Room air conditioners, casement slider	All	*CEER* = 10.4	10 CFR 430 Appendix F

a. Source: Federal Register 76 FR 37431, June 27, 2011.
b. Section 13 contains a complete specification of the referenced test procedures.

Table F-4 Residential Furnaces—Minimum Efficiency Requirements for U.S. Applications (see 10 CFR 430)

Product Class	Size Category (input)	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure[a]
Furnace, gas fired	<225,000 Btu/h	Nonweatherized excluding mobile home	80% AFUE	10 CFR 430 Appendix N
		Nonweatherized mobile home	80% AFUE	
		Weatherized	81% AFUE	
Furnace oil fired	<225,000 Btu/h	Nonweatherized excluding mobile home	83% AFUE $P_{W,SB} \leq 11$ W $P_{W,OFF} \leq 11$ W	10 CFR 430 Appendix N
		Nonweatherized mobile home	75% AFUE $P_{W,SB} \leq 11$ W $P_{W,OFF} \leq 11$ W	
		Weatherized	78% AFUE	
Electric furnace	<225,000 Btu/h	All	78% AFUE $P_{W,SB} \leq 10$ W $P_{W,OFF} \leq 10$ W	10 CFR 430 Appendix N

a. Section 13 contains a complete specification of the referenced test procedure.

Table F-5 Residential Boiler [a] Minimum Efficiency Requirements for U.S. Applications (see 10 CFR 430)

Product Class	Minimum Efficiency [b]	Standby Mode and Off-Mode Power Consumption	Design Requirements
Gas-fired hot-water *boiler*	84% AFUE	$P_{W,SB} \leq 9$ W $P_{W,OFF} \leq 9$ W	Constant burning pilot not permitted. Automatic means for adjusting water temperature required (except for *boilers* equipped with tankless domestic water heating coils) [d].
Gas-fired steam *boiler*	82% AFUE	$P_{W,SB} \leq 8$ W $P_{W,OFF} \leq 8$ W	Constant burning pilot not permitted.
Oil-fired hot-water *boiler*	86% AFUE	$P_{W,SB} \leq 11$ W $P_{W,OFF} \leq 11$ W	Automatic means for adjusting temperature required (except for *boilers* equipped with tankless domestic water heating coils) [d].
Oil-fired steam *boiler*	85% AFUE	$P_{W,SB} \leq 11$ W $P_{W,OFF} \leq 11$ W	None
Electric hot-water *boiler*	None	$P_{W,SB} \leq 8$ W $P_{W,OFF} \leq 8$ W	Automatic means for adjusting temperature required (except for *boilers* equipped with tankless domestic water heating coils) [d].
Electric steam *boiler*	None	$P_{W,SB} \leq 8$ W $P_{W,OFF} \leq 8$ W	None

a. 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).
b. Annual Fuel Utilization Efficiency, as determined in § 430.23(n)(2).
c. Standby mode and off-mode electric power consumption as determined in § 430.23(n)(5).
d. See § 430.32(e)(2)(iv) for additional details regarding automatic means for adjusting water temperature.

Table F-6 Ceiling Fan Efficiency Requirements for U.S. Applications (see 10 CFR 430)

Equipment Type	Size Category	Minimum Efficiency	Test Procedure
Large-diameter ceiling fan	Blade span ≥ 84.5 in.	*CFEI* ≥ 1.00 at high (maximum) speed; and *CFEI* ≥ 1.31 at 40% of high speed or the nearest speed that is not less than 40% of high speed	10 CFR 430 Appendix U

Revise the references to appendix F if the following sections of the standard in both I-P and SI

Update the references to appendix F in section 11 as show below

11.5.2.2.2 HO: HVAC Heating Performance Improvement

where

Ho_{me} = design heating efficiency metric, part-load or annualized where available
HM_{min} = minimum required heating efficiency metric, part-load or annualized where available from Section 6.8.1 ~~or Informative Appendix F~~

Informative Note: An example of an annualized or part-load heating efficiency is AFUE rather than Et or Ec. Where only one efficiency rating is provided for equipment in Section 6.8.1 ~~or Informative Appendix F~~, use that metric.

11.5.2.2.3 H03: HVAC Cooling Performance Improvement. To achieve this credit, space cooling equipment shall exceed the minimum cooling efficiency requirements by 5% or more than listed in the tables in Section 6.8.1 ~~or Informative Appendix F~~. For water-cooled chiller plants, heat rejection efficiency shall also exceed the minimum efficiency listed in Table 6.8.1-7 by at least the percentage improvement in the chiller efficiency.

where
CM_{min} = minimum required cooling efficiency metric, part-load or annualized where available from Section 6.8.1 ~~or Informative Appendix F~~
CM_{des} = design cooling efficiency metric, part-load or annualized where available

Informative Note: An example of an annualized or part-load cooling efficiency is IEER rather than EER, or IPLV kW/ton rather than FL kW/ton. Where only one efficiency rating is provided for equipment in Section 6.8.1 ~~or Informative Appendix F~~, use that metric.

Change 2
Make Editorial Changes to Section 6.4.1.1

Make the following revisions to section 6.4.1.1 and 6.4.1.2.1 in both I-P and SI to convert the list of efficiency tables to a master table. The table also includes where preemption applies which will help users of the standard. An additional change has chiller marking because the requirements for labeling are unique for chillers in section 6.4.1.1 and require update every time the standard is published and are proposed to be eliminated.

Changes shown in blue have been proposed by addendum BQ which is in public review and comment review.

6.4 Mandatory Provisions

6.4.1 Equipment Efficiencies, and 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 6.8.1-21~~ table 6.4.1.1 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 com- bination *system* shall satisfy all stated requirements for the appropriate *space* heating or cooling category. Efficiency requirements apply to all climate zone unless specifically noted in the table.

~~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, "Liquid Chilling Packages—Minimum Efficiency Requirements" (See Section 6.4.1.2 for liquid-cooled centrifugal liquid-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—Minimum Efficiency Requirements"~~
~~h. Table 6.8.1-8, "Electrically Operated Variable-Refrigerant-Flow Air Conditioners—Minimum Efficiency Requirements"~~
~~i. Table 6.8.1-9, "Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps—Minimum Efficiency Requirements~~
~~j. Table 6.8.1-10, "Floor-Mounted Air Conditioners and Condensing Units Serving Computer Rooms—Minimum Efficiency Requirements"~~
~~k. Table 6.8.1-11, "Commercial Refrigerators, Commercial Freezers, and Refrigeration—Minimum Efficiency Requirements"~~
~~l. Table 6.8.1-12, "Vapor Compression-Based Indoor Pool Dehumidifiers—Minimum Efficiency Requirements"~~
~~m. Table 6.8.1-13, "Electrically Operated DX-DOAS Units, Single Package and Remote Condenser, with- out Energy Recovery—Minimum Efficiency Requirements"~~
~~n. Table 6.8.1-14, "Electrically Operated DX-DOAS Units, Single Package and Remote Condenser, with Energy Recovery—Minimum Efficiency Requirements"~~

~~o. Table 6.8.1-15, "Electrically Operated Water-Source Heat Pumps—Minimum Efficiency Requirements"~~
~~p. Table 6.8.1-16, "Heat Pump and Heat Recovery Water-Chilling Packages—Minimum Efficiency Requirement"~~
~~q. Table 6.8.1-17, "Ceiling-Mounted Computer Room Air Conditioners—Minimum Efficiency Requirements"~~
~~r. Table 6.8.1-18, "Walk-In Cooler and Freezer Display Door Efficiency Requirements"~~
~~s. Table 6.8.1-19, "Walk-In Cooler and Freezer Nondisplay Door Efficiency Requirements"~~
~~t. Table 6.8.1-20, "Walk-In Cooler and Freezer Refrigeration System Efficiency Requirements"~~
~~u. Table 6.8.1-21, "Ceiling Fan Efficiency Requirements"~~
~~v. Table 6.8.1-22, "Room Air Conditioners and Room Air Conditioner Heat Pumps Installed Outside the United States—Minimum Efficiency Requirements"~~

Table 6.4.1.1 Equipment Minimum Efficiency Requirements

Table Number	Table Description	DOE Preemption [a]
6.8.1-1	Electrically Operated Unitary Air Conditioners and Condensing Units	partial
6.8.1-2	Electrically Operated Air-Cooled Unitary Heat Pumps	partial
6.8.1-3	Liquid-Chilling Packages	no
6.8.1-4	Electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, Single-Package Vertical Heat Pumps	yes
6.8.1-5	Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters	yes
6.8.1-6	Gas- and Oil-Fired Boilers	yes
6.8.1-7	Performance Requirements for Heat Rejection Equipment	no
6.8.1-8	Electrically Operated Variable-Refrigerant-Flow Air Conditioners	yes
6.8.1-9	Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps	yes
6.8.1-10	Floor-Mounted Air Conditioners and Condensing Units Serving Computer Rooms	yes
6.8.1-11	Commercial Refrigerators, Commercial Freezers, and Refrigeration	yes
6.8.1-12	Vapor-Compression-Based Indoor Pool Dehumidifiers	no
6.8.1-13	Electrically Operated DX-DOAS Units, Single-Package and Remote Condenser, without Energy Recovery	yes
6.8.1-14	Electrically Operated DX-DOAS Units, Single-Package and Remote Condenser, with Energy Recovery	yes
6.8.1-15	Electrically Operated Water-Source Heat Pumps	yes
6.8.1-16	Heat Pump and Heat Recovery Water-Chilling Packages	no
6.8.1-17	Ceiling-Mounted Computer-Room Air Conditioners	yes
6.8.1-18	Walk-In Cooler and Freezer Display Door	yes
6.8.1-19	Walk-In Cooler and Freezer Non-display Door	yes
6.8.1-20	Walk-In Cooler and Freezer Refrigeration System	yes
6.8.1-21	Ceiling Fan	yes
6.8.1-22	Room Air Conditioners and Room Air Conditioner Heat Pumps	yes

[a] Products that are covered by DOE include a preemption requirement where new effective efficiency requirements preempt prior efficiency levels included in ASHRAE 90.1 and efficiency levels adopted by local city and state U.S. Building Codes

Delete the following requirement in IP and SI in section 6.4.1.2.1 for labeling chillers for performance compliance and the unique requirements for labeling chillers. Chiller performance is always part of the chiller performance submittal package and reviewed by the AHJ. This require is unique to just chillers.

~~*Manufacturers* shall calculate the FL.IP*adj* and PLV.IP*adj* before determining whether to label the chiller per Section 6.4.1.5. Compliance with the most recent Standard 90.1-2007, 2010, 2013, 2016, 2019, 2022 version, or combination or prior versions (multiple versions) thereof, shall be *labeled* on chilling packages within the scope of the standard~~

Change 3
Combine table table 7.4.1 Performance Requirements for Water-Heating Equipment and F-2 Minimum Energy Efficiency Requirements for Water Heaters and Pool Heaters

into a new combined table 7.4.1

Delete the current I-P and SI table 7.4.1 which will be replaced with new combined table 7.4.1 and F-2. We have only shown the current I-P table 7.4.1 for reference. Note that the efficiency requirements have not been changed and are not open for public review and comment.

~~Table 7.4.1 Performance Requirements for Water-Heating Equipment—Minimum Efficiency Requirements~~

~~Equipment Type~~	~~Size Category (Input)~~	~~Subcategory or Rating Condition~~	~~Performance Required[a]~~	~~Test Procedure[b,c]~~
~~Electric table-top *water heaters*~~	~~≤12 *kW*~~	~~<4000 (Btu/h)/gal ≥20 gal and ≤120 gal~~	~~For applications outside U.S., see footnote (h). For U.S. applications, see footnote (g).~~	~~10 CFR 430 Appendix E~~
~~Electric storage *water heaters*~~	~~≤12 *kW*~~	~~<4000 (Btu/h)/gal ≥20 gal and ≤55 gal~~	~~For applications outside U.S., see footnote (h). For U.S. applications, see footnote (g).~~	~~10 CFR 430 Appendix E~~
		~~<4000 (Btu/h)/gal >55 gal and ≤120 gal~~	~~For applications outside U.S., see footnote (h). For U.S. applications, see footnote (g).~~	~~10 CFR 430 Appendix E~~
	~~>12 *kW*~~	~~<4000 (Btu/h)/gal~~	~~SL ≤ 0.3 + 27/V_m %/h~~	~~10 CFR 431.106~~
~~Electric instantaneous *water heaters*~~	~~≤12 *kW*~~	~~≥4000 (Btu/h)/gal <2 gal~~	~~For applications outside US, see footnote (h). For US applications, see footnote (g).~~	~~10 CFR 430 Appendix E~~
	~~>12 *kW* and ≤58.6 *kW*[e]~~	~~≥4000 (Btu/h)/gal ≤2 gal ≤180°F~~	~~Very small DP: UEF = 0.80 Low DP: UEF = 0.80 Medium DP: UEF = 0.80 High DP: UEF = 0.80~~	~~10 CFR 430 Appendix E~~
	~~>58.6 *kW*[e]~~	~~≥4000 (Btu/h)/gal <10 gal~~	~~No requirement~~	
		~~≥4000 (Btu/h)/gal ≥10 gal~~	~~No requirement~~	
~~Gas storage water heaters~~	~~≤75,000 Btu/h~~	~~<4000 (Btu/h)/gal ≥20 gal and ≤55 gal~~	~~For applications outside U.S., see footnote (h). For U.S. applications, see footnote (g).~~	~~10 CFR 430 Appendix E~~
		~~<4000 (Btu/h)/gal >55 gal and ≤100 gal~~	~~For applications outside U.S., see footnote (h). For U.S. applications, see footnote (g).~~	~~10 CFR 430 Appendix E~~
	~~>75,000 Btu/h and ≤105,000 Btu/h[d]~~	~~<4000 (Btu/h)/gal ≤120 gal ≤180°F~~	~~Very small DP: UEF = 0.2674 − (0.0009 × V_r) Low DP: UEF = 0.5362 − (0.0012 × V_r) Medium DP: UEF = 0.6002 − (0.0011 × V_r) High DP: UEF = 0.6597 − (0.0009 × V_r)~~	~~10 CFR 430 Appendix E~~
	~~>105,000 Btu/h[d,f]~~	~~<4000 (Btu/h)/gal~~	~~80% E_t SL ≤ (Q/800$\sqrt{}$ 110 − V), Btu/h~~	~~10 CFR 431.106~~
~~Gas instantaneous water heaters~~	~~>50,000 Btu/h and ≤200,000 Btu/h~~	~~≥4000 (Btu/h)/gal <2 gal~~	~~For applications outside U.S., see footnote (h). For U.S. applications, see footnote (g).~~	~~10 CFR 430 Appendix E~~
	~~≥200,000 Btu/h[d,f]~~	~~≥4000 (Btu/h)/gal <10 gal~~	~~80% E_t~~	~~10 CFR 431.106~~
	~~≥200,000 Btu/h[f]~~	~~≥4000 (Btu/h)/gal ≥10 gal~~	~~80% E_t SL ≤ (Q/800$\sqrt{}$ 110 − V), Btu/h~~	

~~a. Thermal *efficiency* (E_t) is a minimum requirement, while standby loss is a maximum requirement. In the standby loss equation, V is the rated volume in gallons and Q is the name-plate input rate in Btu/h. V_m is the measured volume in the tank in gallons. Standby loss for electric water heaters is in terms of %/h and denoted by the term "S," and standby loss for gas and oil water heaters is in terms of Btu/h and denoted by the term "SL." Draw pattern (DP) refers to the water draw profile in the uniform *energy factor* (UEF) test. UEF and *energy factor* (*EF*) are minimum requirements. In the UEF standard equations, V_r refers to the rated volume in gallons.~~

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

e. Electric instantaneous water heaters with input capacity >12 kW and ≤58.6 kW must comply with the requirements for the 58.6 kW if the water heater either (1) has a storage volume >2 gal; (2) is designed to provide outlet hot water at temperatures greater than 180°F; or (3) uses three-phase power.

d. Gas storage water heaters with input capacity >75,000 Btu/h and ≤105,000 Btu/h must comply with the requirements for the >105,000 Btu/h if the water heater either (1) has a storage volume >120 gal; (2) is designed to provide outlet hot water at temperatures greater than 180°F; or (3) uses three-phase power

e. Oil storage water heaters with input capacity >105,000 Btu/h and ≤140,000 Btu/h must comply with the requirements for the >140,000 Btu/h if the water heater either (1) has a storage volume >120 gal; (2) is designed to provide outlet hot water at temperatures greater than 180°F; or (3) uses three-phase power

f. Refer to Section 7.5.3 for additional requirements for gas storage and instantaneous *water heaters* and gas *hot-water supply boilers*.

g. *Water heaters* or gas *pool* heaters in this category or subcategory are regulated as consumer products by the U.S. DOE as defined in 10 CFR 430.

h. Where this standard is being applied to a building outside the U.S. and Canada and water heaters in this subcategory are being installed in that building, those water heaters shall meet the local efficiency requirements. If there are no local efficiency standards for residential water heaters, consideration should be given to using the U.S. DOE efficiency requirements shown in Informative Appendix F, Table F-2.

Table 7.4-1 Performance Requirements for Water-Heating Equipment—Minimum Efficiency Requirements *(Continued)*

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Performance Required [a]	Test Procedure [b,c]
Oil storage water heaters	≤105,000 Btu/h	<4000(Btu/h)/gal ≤50 gal	For applications outside U.S., see footnote (h). For U.S. applications, see footnote (g).	10 CFR 430 Appendix E
	>105,000 Btu/h and ≤140,000 Btu/h [e]	≤120 gal <4000 (Btu/h)/gal ≤180°F	Very small DP: UEF = 0.2932 − (0.0015 × V_r) Low DP: UEF = 0.5596 − (0.0018 × V_r) Medium DP: UEF = 0.6194 − (0.0016 × V_r) High DP: UEF = 0.6740 − (0.0013 × V_r)	10 CFR 430 Appendix E
	>140,000 Btu/h	<4000 (Btu/h)/gal	80% E_t SL ≤ (Q/800 + 110 $\sqrt{V}$), Btu/h	10 CFR 431.106
Oil instantaneous water heaters	≤210,000 Btu/h	≥4000 (Btu/h)/gal <2 gal	80% E_t EF ≥ 0.59 − 0.0005 × V	10 CFR 430 Appendix E
	>210,000 Btu/h	≥4000 (Btu/h)/gal <10 gal	80% E_t	10 CFR 431.106
	>210,000 Btu/h	≥4000 (Btu/h)/gal ≥10 gal	78% E_t SL ≤ (Q/800 + 110 $\sqrt{V}$), Btu/h	
Hot-water supply boilers, gas and oil [f]	≥300,000 Btu/h and <12,500,000 Btu/h	≥4000 (Btu/h)/gal <10 gal	80% E_t	10 CFR 431.106
Hot-water supply boilers, gas [f]	≥300,000 Btu/h and <12,500,000 Btu/h	≥4000 (Btu/h)/gal ≥10 gal	80% E_t SL ≤ (Q/800 + 110 $\sqrt{V}$), Btu/h	10 CFR 431.106
Hot-water supply boilers, oil	≥300,000 Btu/h and <12,500,000 Btu/h	≥4000 (Btu/h)/gal ≥10 gal	78% E_t SL ≤ (Q/800 + 110 $\sqrt{V}$), Btu/h	10 CFR 431.106
Pool heaters, gas	All		82% E_t for commercial *pool* heaters and for applications outside U.S. For U.S. applications, see footnote (g).	10 CFR 430 Appendix P
Heat pump *pool* heaters	All	50°F db 44.2°F wb *outdoor air* 80.0°F entering water	4.0 *COP*	10 CFR 430 Appendix P
Unfired storage tanks	All		R-12.5	(none)

a. Thermal *efficiency* (E_t) is a minimum requirement, while standby loss is a maximum requirement. In the standby loss equation, V is the rated volume in gallons and Q is the name-plate input rate in Btu/h. V_m is the measured volume in the tank in gallons. Standby loss for electric water heaters is in terms of %/h and denoted by the term "S," and standby loss for gas and oil water heaters is in terms of Btu/h and denoted by the term "SL." Draw pattern (DP) refers to the water draw profile in the uniform *energy factor* (UEF) test. UEF and *energy factor* (*EF*) are minimum requirements. In the UEF standard equations, V_r refers to the rated volume in gallons.

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

c. Electric instantaneous water heaters with input capacity >12 kW and ≤58.6 kW must comply with the requirements for the 58.6 kW if the water heater either (1) has a storage volume >2 gal; (2) is designed to provide outlet hot water at temperatures greater than 180°F; or (3) uses three-phase power.

d. Gas storage water heaters with input capacity >75,000 Btu/h and ≤105,000 Btu/h must comply with the requirements for the >105,000 Btu/h if the water heater either (1) has a storage volume >120 gal; (2) is designed to provide outlet hot water at temperatures greater than 180°F; or (3) uses three-phase

~~power~~

~~e. Oil storage water heaters with input capacity >105,000 Btu/h and ≤140,000 Btu/h must comply with the requirements for the >140,000 Btu/h if the water heater either (1) has a storage volume >120 gal; (2) is designed to provide outlet hot water at temperatures greater than 180°F; or (3) uses three-phase power~~

~~f. Refer to Section 7.5.3 for additional requirements for gas storage and instantaneous *water heaters* and gas *hot-water supply boilers*.~~

~~g. *Water heaters* or gas *pool* heaters in this category or subcategory are regulated as consumer products by the U.S. DOE as defined in 10 CFR 430.~~

~~Where this standard is being applied to a building outside the U.S. and Canada and water heaters in this subcategory are being installed in that building, those water heaters shall meet the local efficiency requirements. If there are no local efficiency standards for residential water heaters, consideration should be given to using the U.S. DOE efficiency requirements shown in Informative Appendix F, Table F-2.~~

Insert the new 7.4.1 I-P combined old table 7.4.1 and table F-2 as shown below.
Note values shown in red are based on new DOE defined efficiency requirements o that go into effect on 5/6/2029 for residential products and 10/6/2026 for commercial products as defined in the table or commercial products missing from table 7.4.1.

Table 7.4.1 Performance Requirements for Water Heaters and Pool Heaters- Minimum Efficiency Requirements (IP)

Equipment Type	Size Category (Input)	Subcategory, or Rating Condition	Draw pattern (DP) [c]	Minimum Performance Required	Test Procedure [a]
Gas-Fired Storage Water Heaters					
Gas-fired storage *water heater* [h]	≤75,000 Btu/h	<4000 (Btu/h)/gal <20 gal	Very small	No requirements before 5/6/2029 UEF = 0.2062 - (0.0020 x V_{eff}) after 5/6/2029	10 CFR 430 Appendix E
			Low	No requirements before 5/6/2029 UEF = 0.4893 - (0.0027 x V_{eff}) after 5/6/2029	
			Medium	No requirements before 5/6/2029 UEF = 0.5758 - (0.0023 x V_{eff}) after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.6586 - (0.0020 x V_{eff}) after 5/6/2029	
	≤75,000 Btu/h	<4000 (Btu/h)/gal ≥20 gal and ≤55 gal	Very small	UEF = 0.3456 – (0.0020 × V_r) [b,l] before 5/6/2029 UEF = 0.3925 – (0.0020 × V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	UEF = 0.5982 – (0.0019 × V_r) [b,l] before 5/6/2029 UEF = 0.6451 – (0.0019 × V_{eff}) [b,l] after 5/6/2029	
			Medium	UEF = 0.6483 – (0.0017 × V_r) [b,l] before 5/6/2029 UEF = 0.7046 – (0.0017 × V_{eff}) [b,l] after 5/6/2029	
			High	UEF = 0.6920 – (0.0013 × V_r) [b,l] before 5/6/2029 UEF = 0.7424 – (0.0013 × V_{eff}) [b,l] after 5/6/2029	
		<4000 (Btu/h)/gal >55 gal and ≤100 gal	Very small	UEF = 0.6470 – (0.0006 × V_r) [b,l] before 5/6/2029 UEF = 0.6470 – (0.0013 × V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	UEF = 0.7689 – (0.0005 × V_r) [b,l] before 5/6/2029 UEF = 0.7424 – (0.0013 × V_{eff}) [b,l] after 5/6/2029	
			Medium	UEF = 0.7897 – (0.0004 × V_r) [b,l] before 5/6/2029 UEF = 0.7424 – (0.0013 × V_{eff}) [b,l] after 5/6/2029	
			High	UEF = 0.8072 – (0.0003 × V_r) [b,l] before 5/6/2029 UEF = 0.7424 – (0.0013 × V_{eff}) [b,l] after 5/6/2029	
	≤75,000 Btu/h	<4000 (Btu/h)/gal >100 gal	Very small	No requirements before 5/6/2029 UEF = 0.1482 - (0.0007 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	No requirements before 5/6/2029 UEF = 0.4342 - (0.0017 x V_{eff}) [b,l] after 5/6/2029	
			Medium	No requirements before 5/6/2029 UEF = 0.5596 - (0.0020 x V_{eff}) [b,l] after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.6658 - (0.0019 x V_{eff}) [b,l] after 5/6/2029	
	>75,000 Btu/h and ≤105,000 Btu/h [h]	<4000 (Btu/h)/gal ≤120 gal ≤180°F	Very small	UEF = 0.2674 – (0.0009 × V_r) [b,l]	10 CFR 430 Appendix E
			Low	UEF = 0.5362 – (0.0012 × V_r) [b,l]	
			Medium	UEF = 0.6002 – (0.0011 × V_r) [b,l]	
			High	UEF = 0.6597 – (0.0009 × V_r) [b,l]	

	≥105,000 Btu/h [h]	<4000 (Btu/h)/gal		80% E_t [e] and SL ≤ (Q/800 + 110 ×$V_r^{0.5}$) Btu/h [f] before 10/6/2026 95% E_t [e] and SL ≤ 0.86 x (Q/800 + 110 ×$V_r^{0.5}$) Btu/h [f] after 10/6/2026	10 CFR 431.106
Oil-Fired Storage Water Heaters					
Oil-fired storage *water heater*	≤105,000 Btu/h	<4000(Btu/h)/gal <50 gal	Very small	UEF = 0.2509 – (0.0012 × V_r) [b,l] before 5/6/2029 UEF = 0.2909 - (0.0012 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	UEF = 0.5330 – (0.0016 × V_r) [b,l] before 5/6/2029 UEF = 0.5730 - (0.0016 x V_{eff}) [b,l] after 5/6/2029	
			Medium	UEF = 0.6078 – (0.0016 × V_r) [b,l] before 5/6/2029 UEF = 0.6478 - (0.0016 x V_{eff}) [b,l] after 5/6/2029	
			High	UEF = 0.6815 – (0.0014 × V_r) [b,l] before 5/6/2029 UEF = 0.7215 - (0.0014 x V_{eff}) [b,l] after 5/6/2029	
	≤105,000 Btu/h	<4000(Btu/h)/gal ≥50 gal	Very small	No requirements before 5/6/2029 UEF = 0.1580 - (0.0009 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	No requirements before 5/6/2029 UEF = 0.4390 - (0.0020 x V_{eff}) [b,l] after 5/6/2029	
			Medium	No requirements before 5/6/2029 UEF = 0.5389 - (0.0021 x V_{eff}) [b,l] after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.6172 - (0.0021 x V_{eff}) [b,l] after 5/6/2029	
	>105,000 Btu/h and ≤140,000 Btu/h [i]	≤120 gal 4000 (Btu/h)/gal ≤180°F	Very small	UEF = 0.2932 – (0.0015 × V_r) [b,l]	10 CFR 430 Appendix E
			Low	UEF = 0.5596 – (0.0018 × V_r) [b,l]	
			Medium	UEF = 0.6194 – (0.0016 × V_r) [b,l]	
			High	UEF = 0.6740 – (0.0013 × V_r) [b,l]	
	≥140,000 Btu/h [h]	<4000 (Btu/h)/gal		80% E_t [e] SL ≤ (Q/800 + 110 ×$V_r^{0.5}$) Btu/h [f]	10 CFR 431.106
Electric and Heat Pump Storage Water Heaters					
Very Small Electric Storage *Water heaters*	≤12 *kW*	<20 gal	Very small	No requirements before 5/6/2029 UEF = 0.5925 - (0.0059 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	No requirements before 5/6/2029 UEF = 0.8642 - (0.0030 x V_{eff}) [b,l] after 5/6/2029	
			Medium	No requirements before 5/6/2029 UEF = 0.9096 - (0.0020 x V_{eff}) [b,l] after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.9430 - (0.0012 x V_{eff}) [b,l] after 5/6/2029	
Small Electric Storage *Water heaters*	≤12 *kW*	≥20 gal and ≤35 gal	Very small	No requirements before 5/6/2029 UEF = 0.5925 - (0.0059 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	No requirements before 5/6/2029 UEF = 0.8642-(0.0030 x V_{eff}) [b,l] after 5/6/2029	
			Medium	No requirements before 5/6/2029 UEF = 0.9096 - (0.0020 x V_{eff}) [b,l] after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.9430 - (0.0012 x V_{eff}) [b,l] after 5/6/2029	
Electric storage and HP storage	≤12 *kW*	<4000 (Btu/h)/gal ≥20 gal and ≤55 gal	Very small	UEF = 0.8808 – (0.0008 × V_r) [b,l] before 5/6/2029 UEF = 2.30 [l] after 5/6/2029	10 CFR 430 Appendix E
			Low	UEF = 0.9254 – (0.0003 × V_r) [b,l] before 5/6/2029	

water heaters [d]				UEF = 2.30 [l] after 5/6/2029	
			Medium	UEF = 0.9307 – (0.0002 × V_r) [b,l] before 5/6/2029 UEF = 2.30 [l] after 5/6/2029	
			High	UEF = 0.9349 – (0.0001 × V_r) [b,l] before 5/6/2029 UEF = 2.30 [l] after 5/6/2029	
		≤4000 (Btu/h)/gal >55 gal and ≤120 gal	Very small	UEF = 1.9236 – (0.0011 × V_r) [b,l] before 5/6/2029 UEF=2.50 [l] after 5/6/2029	
			Low	UEF = 2.0440 – (0.0011 × V_r [b,l] before 5/6/2029 UEF=2.50 [l] after 5/6/2029	
			Medium	UEF = 2.1171 – (0.0011 × V_r) [b,l] before 5/6/2029 UEF=2.50 [l] after 5/6/2029	
			High	UEF = 2.2418 – (0.0011 × V_r) [b,l] before 5/6/2029 UEF=2.50 [l] after 5/6/2029	
	≤12 *kW*	<4000 (Btu/h)/gal >120 gal	Very small	No requirements before 5/6/2029 UEF = 0.3574-(0.0012 x V_{eff}) [b,l] after 5/6/2029	
			Low	No requirements before 5/6/2029 UEF = 0.7897-(0.0019 x V_{eff}) [b,l] after 5/6/2029	
			Medium	No requirements before 5/6/2029 UEF = 0.8884-(0.0017 x V_{eff}) [b,l] after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.9575-(0.0013 x V_{eff}) [b,l] after 5/6/2029	
Electric storage *water heaters*	>12 kW	<4000 (Btu/h)/gal ≤140 gal		No efficiency requirements SL ≤ 0.3 + 27/V_m %/h [f]	
		<4000 (Btu/h)/gal >140 gal		No requirements	10 CFR 431.106
HP storage *water heaters*	>12 kW			No requirements	
Electric Grid-enabled water heaters		≥2 gal and ≤75 gal	Very small	No requirements before 5/6/2029 UEF = 0.8086-(0.0050 x V_{eff}) [b,l] after 5/6/2029	
			Low	No requirements before 5/6/2029 UEF = 0.9123-(0.0020 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Medium	No requirements before 5/6/2029 UEF = 0.9252-(0.0015 x V_{eff}) [b,l] after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.9350-(0.0011 x V_{eff}) [b,l] after 5/6/2029	
		>75 gal	Very small	UEF = 1.0136 – (0.0028 × V_r) [b,l] before 5/6/2029 UEF =1.0136-(0.0028 x V_{eff}) [b,l] after 5/6/2029	
			Low	UEF = 0.9984 – (0.0014 × V_r) [b,l] before 5/6/2029 UEF = 0.9984 - (0.0014 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Medium	UEF = 0.9853 – (0.0010 × V_r) [b,l] before 5/6/2029 UEF = 0.9853 - (0.0010 x V_{eff}) [b,l] after 5/6/2029	
			High	UEF = 0.9720 – (0.0007 × V_r) [b,l] before 5/6/2029 UEF = 0.9720 - (0.0007 x V_{eff}) [b,l] after 5/6/2029	
Electric Tabletop *Water Heaters*					
Electric Table-top *water heater*	≤12 *kW*	<20 gal	Very small	No requirements before 5/6/2029 UEF = 0.5925-(0.0059 x V_{eff}) [b,l] after 5/6/2029	
			Low	No requirements before 5/6/2029 UEF = 0.8642-(0.0030 x V_{eff}) [b,l] after 5/6/2029	
Electric Table-top	≤12 *kW*	≤4000 (Btu/h)/gal ≥20 gal and ≤120 gal	Very small	UEF = 0.6323 – (0.0058 × V_r) [b,l] before 5/6/2029 UEF = 0.8623-(0.0058 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E

water heater			Low	UEF = 0.9188 – (0.0031 × V_r) [b,l] before 5/6/2029 UEF = 0.9188-(0.0031 x V_{eff}) [b,l] after 5/6/2029	
			Medium	UEF = 0.9577 – (0.0023 × V_r) [b,l] before 5/6/2029 No requirements after 5/6/2029	
			High	UEF = 0.9884 – (0.0016 × V_r) [b,l] before 5/6/2029 No requirements after 5/6/2029	
Instantaneous Gas *Water Heaters*					
Gas-fired Instantaneous *water heater* [h]	≥50,000 Btu/h and ≤200,000 Btu/h	≥4000 (Btu/h)/gal <2 gal	Very small	UEF = 0.80 [l]	10 CFR 430 Appendix E
			Low	UEF = 0.81 [l]	
			Medium	UEF = 0.81 [l]	
			High	UEF = 0.81 [l]	
	≥200,000 Btu/h	≥4000 (Btu/h)/gal <10 gal		80% E_t [c] and SL ≤ (Q/800 + 110 × $V_r^{0.5}$) Btu/h [f] before 10/06/2026 96% E_t [c] and SL ≤ (Q/800 + 110 × $V_r^{0.5}$) Btu/h [f] after 10/06/2026	10 CFR 431.106
		≥4000 (Btu/h)/gal ≥10 gal		80% E_t [c] SL ≤ (Q/800 + 110 × $V_r^{0.5}$) Btu/h [f] before 10/06/2026 96% E_t [c] SL ≤ (Q/800 + 110 × $V_r^{0.5}$) Btu/h [f] after 10/06/2026	
Oil-fired instantaneous *Water-heaters*					
Oil-fired Instantaneous *water heater*	≥200,000 Btu/h	≥4000 (Btu/h)/gal <10 gal		80% E_t [c] and SL ≤ (Q/800 + 110 × $V_r^{0.5}$) Btu/h [f]	10 CFR 431.106
		≥4000 (Btu/h)/gal ≥10 gal		78% E_t [c] SL ≤ (Q/800 + 110 × $V_r^{0.5}$) Btu/h [f]	
Instantaneous Electric *Water Heaters*					
Electric Instantaneous *water heater*	≤12 *kW*	≥4000 (Btu/h)/gal <2 gal	Very small	UEF = 0.91 [l]	10 CFR 430 Appendix E
			Low	UEF = 0.91 [l]	
			Medium	UEF = 0.91 [l]	
			High	UEF = 0.92 [l]	
	>12 *kW* and ≤58.6 *kW* [g]	≥4000 (Btu/h)/gal <2 gal ≤180 °F	Very small	UEF = 0.91 [l]	
			Low	UEF = 0.91 [l]	
			Medium	UEF = 0.91 [l]	
			High	UEF = 0.92 [l]	
	>58.6 *kW*	≥4000 (Btu/h)/gal <10 gal		80% E_t before 10/6/2026 80% E_t and SL ≤ (2.30 + 67/V_m), %/h [f] after 10/6/2026	
		≥4000 (Btu/h)/gal ≥10 gal		77% E_t before 10/6/2026 80% E_t and	

				SL ≤ (2.30 + 67/V_m), %/h [f] after 10/6/2026	
Pool *Water Heaters*					
Gas-fired *Pool* heater [k]	All			82% E_t [e]	10 CFR 430 Appendix P
Heat pump *Pool* heaters [k]	All	50°F db 44.2°F wb *outdoor air* 80.0°F entering water		4.0 *COP*	10 CFR 430 Appendix P
Hot-water Supply Boilers and Tanks					
Gas-fired *Hot-water supply boilers* [h]	≥300,000 Btu/h and <12,500,000 Btu/h	≥4000 (Btu/h)/gal <10 gal		80% E_t [e]	10 CFR 431.106
		≥4000 (Btu/h)/gal ≥10 gal		80% E_t [e] SL ≤ (Q/800 + 110 × $V^{0.5}$) Btu/h [f]	10 CFR 431.106
Oil-fired *Hot-water supply boilers*	≥300,000 Btu/h and <12,500,000 Btu/h	≥4000 (Btu/h)/gal <10 gal		80% E_t [e]	10 CFR 431.106
		≥4000 (Btu/h)/gal ≥10 gal		78% E_t [e] SL ≤ (Q/800 + 110 × $V^{0.5}$) Btu/h [f]	10 CFR 431.106
Unfired storage tanks	All			R-12.5	10 CFR 431.106

a. Section 13 contains a complete specification, including the year version, of the referenced test procedure.
b. V_r is the rated storage volume (in gallons), and Veff is the Effective Storage Volume (in gallons) as determined pursuant to 10 CFR 429.17.
c. Draw pattern (DP) refers to the water draw profile in the uniform energy factor (UEF) test. UEF are minimum requirements.
d. Standards for ≤12 *kW* electric storage water heaters apply to both *electric resistance water heaters* and heat-pump water heaters.
e. Thermal efficiency (Et) is a minimum requirement, while standby loss is a maximum requirement. In the standby loss equation, V is the rated volume in gallons and Q is the nameplate input rate in Btu/h. Vm is the measured volume in the tank in gallons.
f. Standby loss for electric water heaters is in terms of %/h and denoted by the term "S," and standby loss for gas and oil water heaters is in terms of Btu/h and denoted by the term "SL. Vm is the measured storage volume and Q is the rated input in Btu/h as determined pursuant to 10 CFR 49.44
g. Electric instantaneous water heaters with input capacity >12 kW and ≤58.6 kW must comply with the requirements for the 58.6 kW if the water heater either (1) has a storage volume>2 gal; (2) is designed to provide outlet hot water at temperatures greater than 180°F; or (3) uses three-phase power.
h. Gas storage water heaters with input capacity >75,000 Btu/h and ≤105,000 Btu/h must comply with the requirements for the >105,000 Btu/h if the water heater either (1) has a storage volume >120 gal; (2) is designed to provide outlet hot water at temperatures greater than 180°F; or (3) uses three-phase power
i. Oil storage water heaters with input capacity >105,000 Btu/h and ≤140,000 Btu/h must comply with the requirements for the >140,000 Btu/h if the water heater either (1) has a storage volume >120 gal; (2) is designed to provide outlet hot water at temperatures greater than 180°F; or (3) uses three-phase power
j. Refer to Section 7.5.3 for additional requirements for gas storage and instantaneous water heaters and gas hot-water supply boilers.
k. All *water heaters* or gas pool heaters in this category or subcategory are regulated as consumer products by the U.S. DOE as defined in 10 CFR 430.
l. Where this standard is being applied to a building outside the U.S. and Canada and water heaters in this subcategory are being installed in that building, those water heaters shall meet the local efficiency requirements. If there are no local efficiency standards for residential water heaters, consideration should be given to using the U.S. DOE residential requirements shown in this table.

Insert the new 7.4.1 SI combined old table 7.4.1 and table F-2 as shown below.
Note values shown in red are based on new DOE defined efficiency requirements o that go into effect on 5/6/2029 for residential products and 10/6/2026 for commercial products as defined in the table or commercial products missing from table 7.4.1.

Table 7.4.1 Performance Requirements for Water Heaters and Pool Heaters- Minimum Efficiency Requirements (SI)

Equipment Type	Size Category (Input)	Subcategory, or Rating Condition	Draw pattern (DP) [c]	Minimum Performance Required	Test Procedure [a]
Gas-Fired Storage Water Heaters					
Gas-fired storage *water heater* [h]	≤22 *kW*	<309 W/L <76 L	Very small	No requirements before 5/6/2029 UEF = 0.2062 - (0.0076 x V_{eff}) after 5/6/2029	10 CFR 430 Appendix E
			Low	No requirements before 5/6/2029 UEF = 0.4893 - (0.0102 x V_{eff}) after 5/6/2029	
			Medium	No requirements before 5/6/2029 UEF = 0.5758 - (0.0087 x V_{eff}) after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.6586 - (0.0076 x V_{eff}) after 5/6/2029	
	≤22 *kW*	<309 W/L ≥76 L and ≤208 L	Very small	UEF = 0.3456 – (0.0076 × V_r) [b,l] before 5/6/2029 UEF = 0.3925 – (0.0076 × V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	UEF = 0.5982 – (0.0072 × V_r) [b,l] before 5/6/2029 UEF = 0.6451 – (0.0072 × V_{eff}) [b,l] after 5/6/2029	
			Medium	UEF = 0.6483 – (0.0064 × V_r) [b,l] before 5/6/2029 UEF = 0.7046 – (0.0064 × V_{eff}) [b,l] after 5/6/2029	
			High	UEF = 0.6920 – (0.0049 × V_r) [b,l] before 5/6/2029 UEF = 0.7424 – (0.0049 × V_{eff}) [b,l] after 5/6/2029	
		<309 W/L >208 L and ≤379 L	Very small	UEF = 0.6470 – (0.0023 × V_r) [b,l] before 5/6/2029 UEF = 0.6470 – (0.0049 × V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	UEF = 0.7689 – (0.0019 × V_r) [b,l] before 5/6/2029 UEF = 0.7424 – (0.0049 × V_{eff}) [b,l] after 5/6/2029	
			Medium	UEF = 0.7897 – (0.0015 × V_r) [b,l] before 5/6/2029 UEF = 0.7424 – (0.0049 × V_{eff}) [b,l] after 5/6/2029	
			High	UEF = 0.8072 – (0.0011 × V_r) [b,l] before 5/6/2029 UEF = 0.7424 – (0.0049 × V_{eff}) [b,l] after 5/6/2029	
	≤22 *kW*	<309 W/L >379 L	Very small	No requirements before 5/6/2029 UEF = 0.1482 - (0.0026 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	No requirements before 5/6/2029 UEF = 0.4342 - (0.0064 x V_{eff}) [b,l] after 5/6/2029	
			Medium	No requirements before 5/6/2029 UEF = 0.5596 - (0.0076 x V_{eff}) [b,l] after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.6658 - (0.0072 x V_{eff}) [b,l] after 5/6/2029	
	>22 *kW* and ≤31*kW* [h]	<309 W/L ≤454 L ≤82°C	Very small	UEF = 0.2674 – (0.0034 × V_r) [b,l]	10 CFR 430 Appendix E
			Low	UEF = 0.5362 – (0.0045 × V_r) [b,l]	
			Medium	UEF = 0.6002 – (0.0042 × V_r) [b,l]	
			High	UEF = 0.6597 – (0.0034 × V_r) [b,l]	

	>31 *kW* [h]	≤309 W/L		80% E_t [e] and SL ≤ (Q/234 + 214 ×$V_r^{0.5}$) *kW* [f] before 10/6/2026 95% E_t [e] and SL ≤ 0.86 x (Q/800 + 214 ×$V_r^{0.5}$) *kW* [f] after 10/6/2026	10 CFR 431.106
Oil-Fired Storage Water Heaters					
Oil-fired storage *water heater*	≤31 *kW*	≤309 W/L ≤189 L	Very small	UEF = 0.2509 – (0.0045 × V_r) [b,l] before 5/6/2029 UEF = 0.2909 - (0.0045 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	UEF = 0.5330 – (0.0061 × V_r) [b,l] before 5/6/2029 UEF = 0.5730 - (0.0061 x V_{eff}) [b,l] after 5/6/2029	
			Medium	UEF = 0.6078 – (0.0061 × V_r) [b,l] before 5/6/2029 UEF = 0.6478 - (0.0061 x V_{eff}) [b,l] after 5/6/2029	
			High	UEF = 0.6815 – (0.0053 × V_r) [b,l] before 5/6/2029 UEF = 0.7215 - (0.0053 x V_{eff}) [b,l] after 5/6/2029	
	≤31*kW*	≤309 W/L ≥189 L	Very small	No requirements before 5/6/2029 UEF = 0.1580 - (0.0034 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	No requirements before 5/6/2029 UEF = 0.4390 - (0.0076 x V_{eff}) [b,l] after 5/6/2029	
			Medium	No requirements before 5/6/2029 UEF = 0.5389 - (0.0079 x V_{eff}) [b,l] after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.6172 - (0.0079 x V_{eff}) [b,l] after 5/6/2029	
	>31 *kW* and ≤41 *kW* [i]	≤454 L ≤309 W/L ≤82°C	Very small	UEF = 0.2932 – (0.0057 × V_r) [b,l]	10 CFR 430 Appendix E
			Low	UEF = 0.5596 – (0.0068 × V_r) [b,l]	
			Medium	UEF = 0.6194 – (0.0061 × V_r) [b,l]	
			High	UEF = 0.6740 – (0.0049 × V_r) [b,l]	
	>41 *kW* [h]	≤310 W/L		80% E_t [e] SL ≤ (Q/234 + 214 ×$V_r^{0.5}$) *kW* [f]	10 CFR 431.106
Electric and Heat Pump Storage Water Heaters					
Very Small Electric Storage *Water heaters*	≤12 *kW*	<76 L	Very small	No requirements before 5/6/2029 UEF = 0.5925 - (0.0223 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	No requirements before 5/6/2029 UEF = 0.8642 - (0.0114 x V_{eff}) [b,l] after 5/6/2029	
			Medium	No requirements before 5/6/2029 UEF = 0.9096 - (0.0076 x V_{eff}) [b,l] after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.9430 - (0.0045 x V_{eff}) [b,l] after 5/6/2029	
Small Electric Storage *Water heaters*	≤12 *kW*	≥76 L and ≤132 L	Very small	No requirements before 5/6/2029 UEF = 0.5925 - (0.0223 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Low	No requirements before 5/6/2029 UEF = 0.8642-(0.0114 x V_{eff}) [b,l] after 5/6/2029	
			Medium	No requirements before 5/6/2029 UEF = 0.9096 - (0.0076 x V_{eff}) [b,l] after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.9430 - (0.0045 x V_{eff}) [b,l] after 5/6/2029	
Electric storage and HP storage	≤12 *kW*	≤309 W/L ≥76 L and ≤208 L	Very small	UEF = 0.8808 – (0.0030 × V_r) [b,l] before 5/6/2029 UEF = 2.30 [l] after 5/6/2029	10 CFR 430 Appendix E
			Low	UEF = 0.9254 – (0.0011 × V_r) [b,l] before 5/6/2029	

water heaters [d]				UEF = 2.30 [l] after 5/6/2029	
			Medium	UEF = 0.9307 – (0.0008 × V_r) [b,l] before 5/6/2029 UEF = 2.30 [l] after 5/6/2029	
			High	UEF = 0.9349 – (0.0004 × V_r) [b,l] before 5/6/2029 UEF = 2.30 [l] after 5/6/2029	
		≤309 W/L >208 L and ≤454 L	Very small	UEF = 1.9236 – (0.0042 × V_r) [b,l] before 5/6/2029 UEF=2.50 [l] after 5/6/2029	
			Low	UEF = 2.0440 – (0.0042 × V_r [b,l] before 5/6/2029 UEF=2.50 [l] after 5/6/2029	
			Medium	UEF = 2.1171 – (0.0042 × V_r) [b,l] before 5/6/2029 UEF=2.50 [l] after 5/6/2029	
			High	UEF = 2.2418 – (0.0042 × V_r) [b,l] before 5/6/2029 UEF=2.50 [l] after 5/6/2029	
	≤12 *kW*	≤309 W/L >454 L	Very small	No requirements before 5/6/2029 UEF = 0.3574-(0.0045 x V_{eff}) [b,l] after 5/6/2029	
			Low	No requirements before 5/6/2029 UEF = 0.7897-(0.0072 x V_{eff}) [b,l] after 5/6/2029	
			Medium	No requirements before 5/6/2029 UEF = 0.8884-(0.0064 x V_{eff}) [b,l] after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.9575-(0.0049 x V_{eff}) [b,l] after 5/6/2029	
Electric storage *water heaters*	>12 *kW*	<309 W/L ≤530 L		No efficiency requirements SL ≤ 0.3 + 7.13/V_m %/h [f]	
		≤309 W/L >530 L		No requirements	10 CFR 431.106
HP storage *water heaters*	>12 *kW*			No requirements	
Electric Grid-enabled water heaters		≥8 L and ≤284 L	Very small	No requirements before 5/6/2029 UEF = 0.8086-(0.0189 x V_{eff}) [b,l] after 5/6/2029	
			Low	No requirements before 5/6/2029 UEF = 0.9123-(0.0076 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Medium	No requirements before 5/6/2029 UEF = 0.9252-(0.0057 x V_{eff}) [b,l] after 5/6/2029	
			High	No requirements before 5/6/2029 UEF = 0.9350-(0.0042 x V_{eff}) [b,l] after 5/6/2029	
		>284 L	Very small	UEF = 1.0136 – (0.0106 × V_r) [b,l] before 5/6/2029 UEF =1.0136-(0.0106 x V_{eff}) [b,l] after 5/6/2029	
			Low	UEF = 0.9984 – (0.0053 × V_r) [b,l] before 5/6/2029 UEF = 0.9984 - (0.0053 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E
			Medium	UEF = 0.9853 – (0.0038 × V_r) [b,l] before 5/6/2029 UEF = 0.9853 - (0.0038 x V_{eff}) [b,l] after 5/6/2029	
			High	UEF = 0.9720 – (0.0026 × V_r) [b,l] before 5/6/2029 UEF = 0.9720 - (0.0026 x V_{eff}) [b,l] after 5/6/2029	
Electric Tabletop *Water Heaters*					
Electric Tabletop *water heater*	≤12 *kW*	<76 L	Very small	No requirements before 5/6/2029 UEF = 0.5925-(0.0223 x V_{eff}) [b,l] after 5/6/2029	
			Low	No requirements before 5/6/2029 UEF = 0.8642-(0.0114 x V_{eff}) [b,l] after 5/6/2029	
Electric Tabletop	≤12 *kW*	≤309 W/L ≥76 L and ≤454 L	Very small	UEF = 0.6323 – (0.0220 × V_r) [b,l] before 5/6/2029 UEF = 0.8623-(0.0220 x V_{eff}) [b,l] after 5/6/2029	10 CFR 430 Appendix E

water heater			Low	UEF = 0.9188 – (0.0117 × V_r) [b,l] before 5/6/2029 UEF = 0.9188-(0.0117 x V_{eff}) [b,l] after 5/6/2029	
			Medium	UEF = 0.9577 – (0.0087 × V_r) [b,l] before 5/6/2029 No requirements after 5/6/2029	
			High	UEF = 0.9884 – (0.0061 × V_r) [b,l] before 5/6/2029 No requirements after 5/6/2029	
Instantaneous Gas *Water Heaters*					
Gas-fired Instantaneous *water heater* [h]	≥15 *kW* and ≤59 *kW*	≥309 W/L <8 L	Very small	UEF = 0.80 [l]	10 CFR 430 Appendix E
			Low	UEF = 0.81 [l]	
			Medium	UEF = 0.81 [l]	
			High	UEF = 0.81 [l]	
	≥59 *kW*	≥309 W/L <38 L		80% E_t [c] and SL ≤ (Q/234 + 214 × $V_r^{0.5}$) *kW* [f] before 10/06/2026 96% E_t [c] and SL ≤ (Q/234 + 214 × $V_r^{0.5}$) *kW* [f] after 10/06/2026	10 CFR 431.106
		≥309 W/L ≥38 L		80% E_t [c] SL ≤ (Q/234 + 214 × $V_r^{0.5}$) *kW* [f] before 10/06/2026 96% E_t [c] SL ≤ (Q/234 + 214 × $V_r^{0.5}$) *kW* [f] after 10/06/2026	
Oil-fired instantaneous *Water-heaters*					
Oil-fired Instantaneous *water heater*	□59 *kW*	≥309 W/L <38 L		80% E_t [c] and SL ≤ (Q/234 + 214 × $V_r^{0.5}$) *kW* [f]	10 CFR 431.106
		≥309 W/L ≥38 L		78% E_t [c] SL ≤ (Q/234 + 214 × $V_r^{0.5}$) *kW* [f]	
Instantaneous Electric *Water Heaters*					
Electric Instantaneous *water heater*	≤12 *kW*	≥309 W/L <8 L	Very small	UEF = 0.91 [l]	10 CFR 430 Appendix E
			Low	UEF = 0.91 [l]	
			Medium	UEF = 0.91 [l]	
			High	UEF = 0.92 [l]	
	>12 *kW* and ≤58.6 *kW* [g]	≥309 W/L <8 L ≤82 °C	Very small	UEF = 0.91 [l]	
			Low	UEF = 0.91 [l]	
			Medium	UEF = 0.91 [l]	
			High	UEF = 0.92 [l]	
	>58.6 *kW*	≥309 W/L <38 L		80% E_t before 10/6/2026 80% E_t and SL ≤ (2.30 + 17.7/V_m), %/h [f] after 10/6/2026	
		≥309 W/L ≥38 L		77% E_t before 10/6/2026 80% E_t and	

				SL ≤ (2.30 + 17.7/V_m), %/h [f] after 10/6/2026	
Pool *Water Heaters*					
Gas-fired *Pool* heater [k]	All			82% E_t [e]	10 CFR 430 Appendix P
Heat pump *Pool* heaters [k]	All	10°C db 6.78°C wb *outdoor air* 27°C entering water		4.0 *COP*	10 CFR 430 Appendix P
Hot-water Supply Boilers and Tanks					
Gas-fired *Hot-water supply boilers* [h]	≥88 *kW* and <3,664 *kW*	≥310 W/L <38 L		80% E_t [e]	10 CFR 431.106
		≥310 W/L ≥38 L		80% E_t [e] SL ≤ (Q/234 + 214 × $V^{0.5}$) *kW* [f]	10 CFR 431.106
Oil-fired *Hot-water supply boilers*	≥88 *kW* and <3,664 *kW*	≥310 W/L <38 L		80% E_t [e]	10 CFR 431.106
		≥310 W/L ≥38 L		78% E_t [e] SL ≤ (Q/234 + 214 × $V^{0.5}$) *kW* [f]	10 CFR 431.106
Unfired storage tanks	All			R-12.5	10 CFR 431.106

a. Section 13 contains a complete specification, including the year version, of the referenced test procedure.
b. V_r is the rated storage volume (in gallons), and Veff is the Effective Storage Volume (in Liters) as determined pursuant to 10 CFR 429.17.
c. Draw pattern (DP) refers to the water draw profile in the uniform energy factor (UEF) test. UEF are minimum requirements.
d. Standards for ≤12 *kW* electric storage water heaters apply to both *electric resistance water heaters* and heat-pump water heaters.
e. Thermal efficiency (Et) is a minimum requirement, while standby loss is a maximum requirement. In the standby loss equation, V is the rated volume in gallons and Q is the nameplate input rate in kWh. Vm is the measured volume in the tank in liters.
f. Standby loss for electric water heaters is in terms of %/h and denoted by the term "S," and standby loss for gas and oil water heaters is in terms of Btu/h and denoted by the term "SL. Vm is the measured storage volume and Q is the rated input in *kW* as determined pursuant to 10 CFR 49.44
g. Electric instantaneous water heaters with input capacity >12 *kW* and ≤58.6 *kW* must comply with the requirements for the 58.6 kW if the water heater either (1) has a storage volume>8 L; (2) is designed to provide outlet hot water at temperatures greater than 82°C; or (3) uses three-phase power.
h. Gas storage water heaters with input capacity >22 *kW* and ≤31 *kW* must comply with the requirements for the >31 *kW* if the water heater either (1) has a storage volume >454 L; (2) is designed to provide outlet hot water at temperatures greater than 82°C; or (3) uses three-phase power
i. Oil storage water heaters with input capacity >31 *kW* and ≤41 *kW* must comply with the requirements for the >41 *kW* if the water heater either (1) has a storage volume >120 gal; (2) is designed to provide outlet hot water at temperatures greater than 82°C; or (3) uses three-phase power
j. Refer to Section 7.5.3 for additional requirements for gas storage and instantaneous water heaters and gas hot-water supply boilers.
k. All *water heaters* or gas pool heaters in this category or subcategory are regulated as consumer products by the U.S. DOE as defined in 10 CFR 430.
l. Where this standard is being applied to a building outside the U.S. and Canada and water heaters in this subcategory are being installed in that building, those water heaters shall meet the local efficiency requirements. If there are no local efficiency standards for residential water heaters, consideration should be given to using the U.S. DOE residential requirements shown in this table.

Change 4
Combine table 6.8.1-5 for Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters

and
table F-4 for Residential Furnaces

into a new combined table 6.8.1-5

Delete the current 6.8.1-5 table and replace the table with the new combined 6.8.1-5 and F-4 table. No changes are being made the efficiency levels and are not open for comment. Only the I-P table is shown but both the 6.8.1-5 IP and SI tables should be deleted, and the new 6.8.1-5 table used.

~~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~~							~~Minimum Efficiency~~ [b]	~~Test Procedure~~ [a]
~~Description~~	~~Fuel~~	~~Electric Power Phase~~	~~Application Location~~	~~Heating Capacity (input), Btu/h~~ [b]	~~Combo Unit Cooling Capacity, Btu/h~~	~~Subtype~~		
~~Warm-air furnace~~	~~Gas~~	~~1~~	~~Inside U.S.~~	~~<225,000~~	~~<65,000~~	~~See Informative Appendix F, Table F-4~~ [f]		
~~Warm-air furnace~~	~~Gas~~	~~1~~	~~Inside U.S.~~	~~<225,000~~	~~≥65,000~~	~~Nonweatherized~~	~~80% *AFUE*~~	~~Appendix N~~ [g]
						~~Weatherized~~	~~81% *AFUE* or 80% E_t~~ [e]	~~Appendix N~~ [g]
								~~ANSI Z21.47~~
~~Warm-air furnace~~	~~Gas~~	~~1~~	~~Outside U.S.~~	~~<225,000~~	~~All~~	~~Nonweatherized~~	~~80% *AFUE*~~	~~Appendix N~~ [g]
						~~Weatherized~~	~~81% *AFUE* or 80% E_t~~ [e]	~~Appendix N~~ [g]
								~~ANSI Z21.47~~
~~Warm-air furnace~~	~~Gas~~	~~3~~	~~All~~	~~<225,000~~	~~All~~	~~Nonweatherized~~	~~80% *AFUE*~~	~~Appendix N~~ [g]
						~~Weatherized~~	~~81% *AFUE* or 80% E_t~~ [e]	~~Appendix N~~ [g]
								~~ANSI Z21.47~~
~~Warm-air furnace~~	~~Gas~~	~~All~~	~~All~~	~~≥ 225,000 and ≤ 400,000~~	~~All~~	~~All~~	~~80% E_t~~ [e] ~~before 1/1/2023 81% E_t~~ [e] ~~after 1/1/2023~~	~~ANSI Z21.47~~
~~Warm-air furnace~~	~~Gas~~	~~All~~	~~Inside U.S.~~	~~> 400,000~~	~~All~~	~~All~~	~~80% E_t~~ [e] ~~before 1/1/2023 81% E_t~~ [e] ~~after 1/1/2023~~	~~ANSI Z21.47~~
~~Warm-air furnace~~	~~Gas~~	~~All~~	~~Outside U.S.~~	~~> 400,000~~	~~All~~	~~All~~	~~80% E_t~~ [e] ~~before 1/1/2023 81% E_t~~ [e] ~~after 1/1/2023~~	~~ANSI Z21.47 or ANSI Z83.8~~
~~Warm-air furnace~~	~~Oil~~	~~1~~	~~Inside U.S.~~	~~<225,000~~	~~<65,000~~	~~See Informative Appendix F, Table F-4~~ [f]		
~~Warm-air furnace~~	~~Oil~~	~~1~~	~~Inside U.S.~~	~~<225,000~~	~~≥65,000~~	~~Nonweatherized~~	~~83% *AFUE*~~	~~Appendix N~~ [g]
						~~Weatherized~~	~~78% *AFUE* or 80% E_t~~ [d]	~~Appendix N~~ [g]
								~~Section 42 UL 727~~
~~Warm-air furnace~~	~~Oil~~	~~1~~	~~Outside U.S.~~	~~<225,000~~	~~All~~	~~Nonweatherized~~	~~83% *AFUE*~~	~~Appendix N~~ [g]
						~~Weatherized~~	~~78% *AFUE* or 80% E_t~~ [d]	~~Appendix N~~ [g]
								~~Section 42 UL 727~~

a. Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure. For this table, the following applies:
   - Appendix N = 10 CFR 430 Appendix N
   - ANSI Z21.47 = Section 2.39, Thermal *Efficiency*, ANSI Z21.47
   - ANSI Z83.3 = Section 2.10, *Efficiency*, ANSI Z83.3
   - UL 727 = Section 42, Combustion, UL 727
   - UL 731 = Section 40, Combustion, UL 731

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

c. 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*.

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

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

f. Includes combination units with cooling capacity <65,000 Btu/h. For U.S. applications of federally covered <225,000 Btu/h products, see Informative Appendix F, Table F-4.

g. 10 CFR 430 is limited to single phase equipment that is not contained within the same cabinet with a central air conditioner whose rated cooling capacity is above 65,000 Btu/ h but for the test and rating procedures are not impacted for three-phase and can be used for *AFUE* ratings for ASHRAE/IES Standard 90.1 three-phase products and single-phase products with a cooling capacity greater than 65,000 Btu/h.

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 *(Continued)*

Equipment Type							Minimum Efficiency [b]	Test Procedure [a]
Description	Fuel	Electric Power Phase	Application Location	Heating Capacity (input), Btu/h [b]	Combo Unit Cooling Capacity, Btu/h	Subtype		
Warm-air furnace	Oil	3	All	<225,000	All	Nonweatherized	83% *AFUE*	Appendix N [g]
						Weatherized	78% *AFUE* or 80% E_t [d]	Appendix N [g]
								Section 42 UL 727
Warm-air furnace	Oil	All	All	≥225,000	All	All	81% E_t [d] before 1/1/2023 82% E_t [d] after 1/1/2023	Section 42 UL 727
Warm-air furnace	Electric	1	Inside U.S.	<225,000	<65,000	See Informative Appendix F, Table F-4 [f]		
Warm-air furnace	Electric	1	Inside U.S.	<225,000	≥65,000	All	96% *AFUE*	Appendix N [g]
Warm-air furnace	Electric	1	Outside U.S.	<225,000	All	All	96% *AFUE*	Appendix N [g]
Warm-air furnace	Electric	3	All	<225,000	All	All	96% *AFUE*	Appendix N [g]
Warm-air duct furnaces	Gas	All	All	All	All	All	80% E_c [d]	ANSI Z83.8
Warm-air unit heaters	Gas	All	All	All	All	All	80% E_c [d,e]	ANSI Z83.8
Warm-air unit heaters	Oil	All	All	All	All	All	80% E_c [d,e]	Section 40 UL 731

a. Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure. For this table, the following applies:
   - Appendix N = 10 CFR 430 Appendix N
   - ANSI Z21.47 = Section 2.39, Thermal *Efficiency*, ANSI Z21.47
   - ANSI Z83.3 = Section 2.10, *Efficiency*, ANSI Z83.3
   - UL 727 = Section 42, Combustion, UL 727
   - UL 731 = Section 40, Combustion, UL 731

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

c. 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*.

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

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

~~f. Includes combination units with cooling capacity <65,000 Btu/h. For U.S. applications of federally covered <225,000 Btu/h products, see Informative Appendix F, Table F-4.~~

~~g. 10 CFR 430 is limited to single phase equipment that is not contained within the same cabinet with a central air conditioner whose rated cooling capacity is above 65,000 Btu/h but for the test and rating procedures are not impacted for three-phase and can be used for *AFUE* ratings for ASHRAE/IES Standard 90.1 three-phase products and single-phase products with a cooling capacity greater than 65,000 Btu/h.~~

Insert the following new I-P combined 6.8.1-5 and F-4 Tables
Items shown in red text are new updated DOE final regulatory efficiency changes

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 (IP)

Equipment Type							Minimum Efficiency [b]	Test Procedure [a]
Description	Fuel	Electric Power Phase	Application Location	Heating Capacity (input) Btu/h [b]	Combo-Unit Cooling Capacity Btu/h	Subtype		
Warm Air Gas Furnaces								
Warm-air furnace	Gas	1	Inside U.S.	<225,000	<65,000	Non-weatherized not including mobile home	80% *AFUE* before 12/18/2028 95% *AFUE* after 12/18/2028	10 CFR 430 Appendix N [f]
						Non-weatherized mobile home	80% *AFUE* before 12/18/2028 95% *AFUE* after 12/18/2028	
						Weatherized	81% *AFUE*	
Warm-air furnace	Gas	1	Inside U.S.	<225,000	≥65,000	Non-weatherized	80% *AFUE* before 12/18/2028 95% *AFUE* after 12/18/2028	10 CFR 430 Appendix N [f]
						Weatherized	81% *AFUE* or 80% E_t [c]	10 CFR 430 Appendix N [f] ANSI Z21.47
Warm-air furnace	Gas	1	Outside U.S.	<225,000	All	Non-weatherized	80% *AFUE* before 12/18/2028 95% *AFUE* after 12/18/2028	10 CFR 430 Appendix N [f]
						Weatherized	81% *AFUE* or 80% E_t [c]	10 CFR 430 Appendix N [f] ANSI Z21.47
Warm-air furnace	Gas	3	All	<225,000	All	Non-weatherized	80% *AFUE* before 12/18/2028 95% *AFUE* after 12/18/2028	10 CFR 430 Appendix N [f]
						Weatherized	81% *AFUE* or 80% E_t [c]	10 CFR 430 Appendix N [f] ANSI Z21.47
Warm-air furnace	Gas	All	All	≥ 225,000 and ≤ 400,000	All	All	81% E_t [c]	ANSI Z21.47
Warm-air furnace	Gas	All	Inside U.S.	> 400,000	All	All	81% E_t [c]	ANSI Z21.47
Warm-air furnace	Gas	All	Outside U.S.	> 400,000	All	All	81% E_t [c]	ANSI Z21.47 or ANSI Z83.8
Warm Air Oil Furnace								
Warm-air	Oil	1	Inside U.S.	<225,000	<65,000	Non-weatherized not	83% *AFUE*	10 CFR 430

furnace						including mobile home	$P_{W,SB}$ ≤ 11 W $P_{W,OFF}$ ≤ 11 W	Appendix N
						Non-weatherized mobile home	75% *AFUE* [f] $P_{W,SB}$ ≤ 11 W $P_{W,OFF}$ ≤ 11 W	
						Weatherized	78% *AFUE* [f]	
Warm-air oil furnace	Oil	1	Inside U.S.	<225,000	≥65,000	Non-weatherized	83% *AFUE*	10 CFR 430 Appendix N [f]
						Weatherized	78% *AFUE* or 80% E_t [c]	10 CFR 430 Appendix N [f] Section 42 UL 727
Warm-air furnace	Oil	1	Outside U.S.	<225,000	All	Non-weatherized	83% *AFUE*	10 CFR 430 Appendix N [f]
						Weatherized	78% *AFUE* or 80% E_t [c]	10 CFR 430 Appendix N [f] Section 42 UL 727
Warm-air furnace	Oil	3	Outside U.S.	<225,000	All	Non-weatherized	83% *AFUE*	10 CFR 430 Appendix N [f]
						Weatherized	78% *AFUE* or 80% E_t [c]	10 CFR 430 Appendix N [f] Section 42 UL 727
Warm-air furnace	Oil	All	All	≥225,000	All	All	82% E_t [c]	Section 42 UL 727
Warm Air Electric Furnace								
Warm-air furnace	Electric	1	Inside U.S.	<225,000	<65,000	All	78% AFUE $P_{W,SB}$ ≤ 10 W $P_{W,OFF}$ ≤ 10 W	10 CFR 430 Appendix N [f]
Warm-air furnace	Electric	1	Inside U.S.	<225,000	≥65,000	All	96% *AFUE*	Appendix N [f]
Warm-air furnace	Electric	1	Outside U.S.	<225,000	All	All	96% *AFUE*	Appendix N [f]
Warm-air furnace	Electric	3	All	<225,000	All	All	96% *AFUE*	Appendix N [f]
Warm Air Duct Gas Furnace								
Warm-air duct furnaces	Gas	All	All	All	All	All	80% E_c [d]	ANSI Z83.8
Warm-air unit heaters	Gas	All	All	All	All	All	80% E_c [d,e]	ANSI Z83.8
Warm Air Duct Oil Furnace								
Warm-air unit heaters	Oil	All	All	All	All	All	80% E_c [d,e]	Section 40 UL 731

a. Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure. For this table, the following applies:
- Appendix N = 10 CFR 430 Appendix N
- ANSI Z21.47 = Section 2.39, Thermal *Efficiency*, ANSI Z21.47
- ANSI Z83.3 = Section 2.10, *Efficiency*, ANSI Z83.3
- UL 727 = Section 42, Combustion, UL 727
- UL 731 = Section 40, Combustion, UL 731

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

c. 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*.

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

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

f. 10 CFR 430 is limited to-single phase equipment that is not contained within the same cabinet with a central air conditioner whose rated cooling capacity is above 65,000 Btu/h but for the test and rating procedures are not impacted for three-phase and can be used for *AFUE* ratings for ASHRAE/IES Standard 90.1 three-phase products and single-phase products with a cooling capacity greater than 65,000 Btu/h.

Insert the following new SI combined 6.8.1-5 and F-4 Tables

Items shown in red text are new updated DOE final regulatory efficiency changes

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 (SI)

Equipment Type							Minimum Efficiency [b]	Test Procedure [a]
Description	Fuel	Electric Power Phase	Application Location	Heating Capacity (input) *kW* [b]	Combo-Unit Cooling Capacity *kW*	Subtype		
Warm Air Gas Furnaces								
Warm-air furnace	Gas	1	Inside U.S.	<66	<19	Non-weatherized not including mobile home	80% *AFUE* before 12/18/2028 95% *AFUE* after 12/18/2028	10 CFR 430 Appendix N [f]
						Non-weatherized mobile home	80% *AFUE* before 12/18/2028 95% *AFUE* after 12/18/2028	
						Weatherized	81% *AFUE*	
Warm-air furnace	Gas	1	Inside U.S.	<66	≥19	Non-weatherized	80% *AFUE* before 12/18/2028 95% *AFUE* after 12/18/2028	10 CFR 430 Appendix N [f]
						Weatherized	81% *AFUE* or 80% E_t [c]	10 CFR 430 Appendix N [f] ANSI Z21.47
Warm-air furnace	Gas	1	Outside U.S.	<66	All	Non-weatherized	80% *AFUE* before 12/18/2028 95% *AFUE* after 12/18/2028	10 CFR 430 Appendix N [f]
						Weatherized	81% *AFUE* or 80% E_t [c]	10 CFR 430 Appendix N [f] ANSI Z21.47
Warm-air furnace	Gas	3	All	<66	All	Non-weatherized	80% *AFUE* before 12/18/2028 95% *AFUE* after 12/18/2028	10 CFR 430 Appendix N [f]
						Weatherized	81% *AFUE* or 80% E_t [c]	10 CFR 430 Appendix N [f] ANSI Z21.47
Warm-air furnace	Gas	All	All	≥ 66 and ≤ 117	All	All	81% E_t [c]	ANSI Z21.47
Warm-air furnace	Gas	All	Inside U.S.	> 117	All	All	81% E_t [c]	ANSI Z21.47
Warm-air furnace	Gas	All	Outside U.S.	> 117	All	All	81% E_t [c]	ANSI Z21.47 or ANSI Z83.8
Warm Air Oil Furnace								
Warm-air furnace	Oil	1	Inside U.S.	<66	<19	Non-weatherized not including mobile home	83% *AFUE* $P_{W,SB}$ ≤ 11 W $P_{W,OFF}$ ≤ 11 W	10 CFR 430 Appendix N
						Non-weatherized	75% *AFUE* [f]	

						mobile home	$P_{W,SB}$ ≤ 11 W $P_{W,OFF}$ ≤ 11 W	
						Weatherized	78% *AFUE* [f]	
Warm-air oil furnace	Oil	1	Inside U.S.	<66	≥19	Non-weatherized	83% *AFUE*	10 CFR 430 Appendix N [f]
						Weatherized	78% *AFUE* or 80% E_t [c]	10 CFR 430 Appendix N [f] Section 42 UL 727
Warm-air furnace	Oil	1	Outside U.S.	<66	All	Non-weatherized	83% *AFUE*	10 CFR 430 Appendix N [f]
						Weatherized	78% *AFUE* or 80% E_t [c]	10 CFR 430 Appendix N [f] Section 42 UL 727
Warm-air furnace	Oil	3	Outside U.S.	<66	All	Non-weatherized	83% *AFUE*	10 CFR 430 Appendix N [f]
						Weatherized	78% *AFUE* or 80% E_t [c]	10 CFR 430 Appendix N [f] Section 42 UL 727
Warm-air furnace	Oil	All	All	≥66	All	All	82% E_t [c]	Section 42 UL 727
Warm Air Electric Furnace								
Warm-air furnace	Electric	1	Inside U.S.	<66	<19	All	78% AFUE $P_{W,SB}$ ≤ 10 W $P_{W,OFF}$ ≤ 10 W	10 CFR 430 Appendix N [f]
Warm-air furnace	Electric	1	Inside U.S.	<66	≥19	All	96% *AFUE*	Appendix N [f]
Warm-air furnace	Electric	1	Outside U.S.	<66	All	All	96% *AFUE*	Appendix N [f]
Warm-air furnace	Electric	3	All	<66	All	All	96% *AFUE*	Appendix N [f]
Warm Air Duct Gas Furnace								
Warm-air duct furnaces	Gas	All	All	All	All	All	80% E_c [d]	ANSI Z83.8
Warm-air unit heaters	Gas	All	All	All	All	All	80% E_c [d,e]	ANSI Z83.8
Warm Air Duct Oil Furnace								
Warm-air unit heaters	Oil	All	All	All	All	All	80% E_c [d,e]	Section 40 UL 731

a. Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure. For this table, the following applies:
   - Appendix N = 10 CFR 430 Appendix N
   - ANSI Z21.47 = Section 2.39, Thermal *Efficiency*, ANSI Z21.47
   - ANSI Z83.3 = Section 2.10, *Efficiency*, ANSI Z83.3
   - UL 727 = Section 42, Combustion, UL 727
   - UL 731 = Section 40, Combustion, UL 731

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

c. 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*.

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

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

f. 10 CFR 430 is limited to-single phase equipment that is not contained within the same cabinet with a central air conditioner whose rated cooling capacity is above 19 *kW* but for the test and rating procedures are not impacted for three-phase and can be used for *AFUE* ratings for ASHRAE/IES Standard 90.1 three-phase products and single-phase products with a cooling capacity greater than 19 *kW*.

Change 5
Combine table 6.8.1-6 Gas- and Oil-Fired Boilers and table F-5 Residential Boiler into a new combined table 6.8.1-6

Delete the current 6.8.1-6 table and replace the table with the new combined 6.8.1-6 and F-5 table. No changes are being made the efficiency levels and are not open for comment. Only the I-P table is shown but both the 6.8.1-5 IP and SI tables should be deleted, and the new 6.8.1-5 table used.

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

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

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_c = combustion *efficiency* (100% less flue losses). See reference document for detailed information.

c. E_t = 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 for additional system compliance requirements.

i. See Informative Appendix F, Table F-4, for U.S. minimum efficiencies for residential products covered by U.S. DOE requirements for U.S. applications.

Insert the new table 6.8.1-6 and F-5 combined table for IP units

Efficiency requirements highlighted in red are changes to align with DOE changes that have been finalized thru final rules

Table 6.8.1-6 Gas- and Oil-Fired Boilers—Minimum Efficiency Requirements (I-P)

Equipment Type [a]	Subcategory	Size Category (Input)	Efficiency Requirements	Test Procedure [a]
Gas-Fired Hot Water Boilers				
Boilers, hot water	Gas fired	<300,000 Btu/h [g,h] for applications in U.S	84% *AFUE* $P_{W,SB}$≤9 W $P_{W,OFF}$≤9 W	10 CFR 430 Appendix N [i,j,k]
		<300,000 Btu/h [g,h] for applications outside U.S.	84% *AFUE*	10 CFR 430 Appendix N [i,k]
		≥300,000 Btu/h and ≤2,500,000 Btu/h [e]	80% E_t [d]	10 CFR 431.86
		>2,500,000 Btu/h [e]	82% E_c [c]	
Oil-Fired Hot Water Boilers				
Boilers, hot water	Oil fired [f]	<300,000 Btu/h [g,h] for applications in U.S	86% *AFUE* $P_{W,SB}$≤11 W $P_{W,OFF}$≤11 W	10 CFR 430 Appendix N [i,j,k]
		<300,000 Btu/h [g,h] for applications outside U.S.	86% *AFUE*	10 CFR 430 Appendix N [i,k]
		≥300,000 Btu/h and ≤2,500,000 Btu/h [e]	82% E_t [d]	10 CFR 431.86
		>2,500,000 Btu/h [e]	84% E_c [c]	
Gas-Fired Steam Boilers				
Boilers, steam	Gas fired	<300,000 Btu/h [g,h] for applications in U.S	85% *AFUE* $P_{W,SB}$≤11 W $P_{W,OFF}$≤11 W	10 CFR 430 Appendix N [i,j,k]
		<300,000 Btu/h [g,h] for applications outside U.S.	85% *AFUE*	10 CFR 430 Appendix N [i,k]
	Gas fired all, except natural draft	≥300,000 Btu/h and ≤2,500,000 Btu/h [e]	79% E_t [d]	10 CFR 431.86
		>2,500,000 Btu/h [e]	79% E_t [d]	
	Gas fired natural draft	≥300,000 Btu/h and ≤2,500,000 Btu/h [e]	79% E_t [d]	
		>2,500,000 Btu/h [e]	79% E_t [d]	
Oil-Fired Steam Boilers				
Boilers, steam	Oil fired [f]	<300,000 Btu/h [g,h] for applications in U.S	85% *AFUE* $P_{W,SB}$≤11 W $P_{W,OFF}$≤11 W	10 CFR 430 Appendix N [i,j,k]
		<300,000 Btu/h [g,h] for applications outside U.S.	85% *AFUE*	10 CFR 430 Appendix N [i,k]
		≥300,000 Btu/h and ≤2,500,000 Btu/h [e]	81% E_t [d]	10 CFR 431.86
		>2,500,000 Btu/h [e]	81% E_t [d]	
Electric Hot-water Boilers				
hot-water *boiler*	Electric	<300,000 Btu/h· [g,h] for applications in U.S	No efficiency $P_{W,SB}$≤8 W $P_{W,OFF}$≤8 W	10 CFR 430 Appendix N [i,j,k]
		<300,000 Btu/h [g,h] for applications outside U.S.	No efficiency	10 CFR 430 Appendix N [i,k]
Electric Steam Boilers				

Steam *boiler*	Electric	<300,000 Btu/h [g,h] for applications in U.S	No efficiency $P_{W,SB} \leq 8$ W $P_{W,OFF} \leq 8$ W	10 CFR 430 Appendix N [i,j,k]
		<300,000 Btu/h [g,h] for applications outside U.S.	No efficiency	10 CFR 430 Appendix N [i,k]

a. Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure
b. 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*.
c. E_C = combustion *efficiency* (100% less flue losses). See reference document for detailed information.
d. E_t = thermal *efficiency*. See reference document for detailed information.
e. Maximum capacity—minimum and maximum ratings as provided for and allowed by the unit's controls.
f. Includes oil-fired (residual).
g. *Boilers* shall not be equipped with a constant burning pilot light.
h. 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.
i. Annual Fuel Utilization Efficiency, as determined in § 430.23(n)(2).
j. Standby mode and off-mode electric power consumption as determined in § 430.23(n)(5).
k. See § 430.32(e)(2)(iv) for additional details regarding automatic means for adjusting water temperature.

Insert the new table 6.8.1-6 and F-5 combined table for SI units

Efficiency requirements highlighted in red are changes to align with DOE changes that have been finalized thru final rules

Table 6.8.1-6 Gas- and Oil-Fired Boilers—Minimum Efficiency Requirements (I-P)

Equipment Type [a]	Subcategory	Size Category (Input)	Efficiency Requirements	Test Procedure [a]
Gas-Fired Hot Water Boilers				
Boilers, hot water	Gas fired	<88 *kW* [g,h] for applications in U.S	84% *AFUE* $P_{W,SB}$≤9 W $P_{W,OFF}$≤9 W	10 CFR 430 Appendix N [i,j,k]
		<88 *kW* [g,h] for applications outside U.S.	84% *AFUE*	10 CFR 430 Appendix N [i,k]
		≥88 *kW* and ≤733 *kW* [e]	80% E_t [d]	10 CFR 431.86
		>733 *kW* [e]	82% E_c [c]	
Oil-Fired Hot Water Boilers				
Boilers, hot water	Oil fired [f]	<88 *kW* [g,h] for applications in U.S	86% *AFUE* $P_{W,SB}$≤11 W $P_{W,OFF}$≤11 W	10 CFR 430 Appendix N [i,j,k]
		<88 *kW* [g,h] for applications outside U.S.	86% *AFUE*	10 CFR 430 Appendix N [i,k]
		≥300,000 Btu/h and ≤88 *kW* [e]	82% E_t [d]	10 CFR 431.86
		>733 *kW* [e]	84% E_c [c]	
Gas-Fired Steam Boilers				
Boilers, steam	Gas fired	<88 *kW* [g,h] for applications in U.S	85% *AFUE* $P_{W,SB}$≤11 W $P_{W,OFF}$≤11 W	10 CFR 430 Appendix N [i,j,k]
		<88 *kW* [g,h] for applications outside U.S.	85% *AFUE*	10 CFR 430 Appendix N [i,k]
	Gas fired all, except natural draft	≥88 *kW* and ≤733 *kW* [e]	79% E_t [d]	10 CFR 431.86
		>733 *kW* [e]	79% E_t [d]	
	Gas fired natural draft	≥88 *kW* and ≤733 *kW* [e]	79% E_t [d]	
		>733 *kW* [e]	79% E_t [d]	
Oil-Fired Steam Boilers				
Boilers, steam	Oil fired [f]	<88 *kW* [g,h] for applications in U.S	85% *AFUE* $P_{W,SB}$≤11 W $P_{W,OFF}$≤11 W	10 CFR 430 Appendix N [i,j,k]
		<88 *kW* [g,h] for applications outside U.S.	85% *AFUE*	10 CFR 430 Appendix N [i,k]
		≥88 *kW* and ≤733 *kW* [e]	81% E_t [d]	10 CFR 431.86
		>733 *kW* [e]	81% E_t [d]	
Electric Hot-water Boilers				
hot-water *boiler*	Electric	<88 *kW*, [g,h] for applications in U.S	No efficiency $P_{W,SB}$≤8 W $P_{W,OFF}$≤8 W	10 CFR 430 Appendix N [i,j,k]
		<88 *kW* [g,h] for applications outside U.S.	No efficiency	10 CFR 430 Appendix N [i,k]
Electric Steam Boilers				

Steam *boiler*	Electric	≤88 *kW* [g,h] for applications in U.S	No efficiency $P_{W,SB}$≤8 W $P_{W,OFF}$≤8 W	10 CFR 430 Appendix N [i,j,k]
		≤88 *kW* [g,h] for applications outside U.S.	No efficiency	10 CFR 430 Appendix N [i,k]

a. Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure
b. These requirements apply to *boilers* with rated input of 2,345 *kW* or less that are not packaged *boilers* and to all packaged *boilers*. Minimum *efficiency* requirements for *boilers* cover all capacities of packaged *boilers*.
c. E_C = combustion *efficiency* (100% less flue losses). See reference document for detailed information.
d. E_t = thermal *efficiency*. See reference document for detailed information.
e. Maximum capacity—minimum and maximum ratings as provided for and allowed by the unit's controls.
f. Includes oil-fired (residual).
g. *Boilers* shall not be equipped with a constant burning pilot light.
h. 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.
i. Annual Fuel Utilization Efficiency, as determined in § 430.23(n)(2).
j. Standby mode and off-mode electric power consumption as determined in § 430.23(n)(5).
k. See § 430.32(e)(2)(iv) for additional details regarding automatic means for adjusting water temperature.

Change 6

Combine table 6.8.1-21 Ceiling Fan Efficiency Requirements

and table F-6 Ceiling Fan Efficiency Requirements for U.S. Applications

into a new combined table 6.8.1-21

Make the following modifications to I-P table 6.8.1-21 to add the table F-6 requirements.

Table 6.8.1-21 Ceiling Fan Efficiency Requirements [a]

Equipment Type	Size Category	Minimum Efficiency[b]	Test Procedure
Large-diameter ceiling fan For application in the U.S.	Blade span ≥ 84.5 in	*CFEI* ≥ 1.00 at high (maximum) speed; and *CFEI* ≥ 1.31 at 40% of high speed or the nearest speed that is not less than 40% of high speed	10 CFR 430 Appendix U
Large-diameter ceiling fan for applications outside the U.S.	Blade span ≥ 84.5 in	*CFEI* ≥ 1.00 at high (maximum) speed; and *CFEI* ≥ 1.31 at 40% of high speed or the nearest speed that is not less than 40% of high speed	10 CFR 430 Appendix U or AMCA Standard 230 and AMCA Standard 208

a. The minimum *efficiency* requirements at both high speed and 40% of maximum speed must be met or exceeded to comply with this standard.
~~b. *Ceiling fans* are regulated in the U.S. as consumer products under 10 CFR 430. For U.S. applications of large-diameter ceiling fans, refer to Informative Appendix F, Table F-6, for the U.S. DOE minimum *efficiency* requirements.~~
~~b.~~ Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

Make the following modifications to SI table 6.8.1-21 to add the table F-6 requirements.

This SI table will be added once all internal comments are completed.

Table 6.8.1-21 Ceiling Fan Efficiency Requirements [a]

Equipment Type	Size Category	Minimum Efficiency[b]	Test Procedure
Large-diameter ceiling fan For application in the U.S.	Blade span ≥ 2.15 m	*CFEI* ≥ 1.00 at high (maximum) speed; and *CFEI* ≥ 1.31 at 40% of high speed or the nearest speed that is not less than 40% of high speed	10 CFR 430 Appendix U
Large-diameter ceiling fan for applications outside the U.S.	Blade span ≥ 2.15 m	*CFEI* ≥ 1.00 at high (maximum) speed; and *CFEI* ≥ 1.31 at 40% of high speed or the nearest speed that is not less than 40% of high speed	10 CFR 430 Appendix U or AMCA Standard 230 and AMCA Standard 208

a. The minimum *efficiency* requirements at both high speed and 40% of maximum speed must be met or exceeded to comply with this standard.
~~b. *Ceiling fans* are regulated in the U.S. as consumer products under 10 CFR 430. For U.S. applications of large-diameter ceiling fans, refer to Informative Appendix F, Table F-6, for the U.S. DOE minimum *efficiency* requirements.~~
~~c.~~ Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.