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Proposed Change 1833

Code Reference(s):	NBC20 Div.B 9.36.3.10. (first printing)
Subject:	HVAC Equipment Efficiency Table
Title:	New Performance Metrics for Small Single-Phase Air Conditioners and Heat Pumps
Description:	This proposed change introduces new energy metrics for small single-phase air conditioners and heat pumps.

This change could potentially affect the following topic areas:

- | | |
|---|--|
| <input type="checkbox"/> Division A | <input checked="" type="checkbox"/> Division B |
| <input type="checkbox"/> Division C | <input type="checkbox"/> Design and Construction |
| <input type="checkbox"/> Building operations | <input checked="" type="checkbox"/> Housing |
| <input type="checkbox"/> Small Buildings | <input type="checkbox"/> Large Buildings |
| <input type="checkbox"/> Fire Protection | <input type="checkbox"/> Occupant safety in use |
| <input type="checkbox"/> Accessibility | <input type="checkbox"/> Structural Requirements |
| <input type="checkbox"/> Building Envelope | <input checked="" type="checkbox"/> Energy Efficiency |
| <input checked="" type="checkbox"/> Heating, Ventilating and Air Conditioning | <input type="checkbox"/> Plumbing |
| | <input type="checkbox"/> Construction and Demolition Sites |

Problem

Effective January 1, 2023, the US Department of Energy (DOE) introduced a series of new energy performance metrics (EER2, SEER2 and HSPF2) in DOE 10 CFR, Part 430-2022, "Energy, Energy Conservation Program for Consumer Products," that is applicable to small single-phase air-cooled air conditioners and air-source heat pumps. These metrics are similar to the previous ones (EER, SEER and HSPF), but use different test conditions that are considered to be more realistic. Larger units and three-phase models are not affected by this amendment.

With the publication of the Regulations Amending the Energy Efficiency Regulations, 2016 (Amendment 17), SOR/2022-265, on December 7, 2022, the Canadian Energy Efficiency Regulations, 2016 (EER), SOR/2016-311, were aligned with DOE 10 CFR, Part 430-2022 by requiring the minimum performance levels to be expressed with the new metrics. As a result, a discrepancy is caused between Section 9.36. of Division B of the NBC and the EER. If manufacturers provided product labels only using the new metrics, the products available on the market could potentially have issues with conformance to the NBC.

This discrepancy will lead to gaps in the Code, and Code users will be unable to evaluate whether HVAC equipment performance complies with the NBC requirements. This, in turn, will lead to difficulties for enforcement officials when determining compliance.

Justification

This proposed change to Section 9.36. updates the reference to the 2022 amendment of DOE 10 CFR, Part 430 and introduces the new energy performance metrics. To facilitate compliance with the NBC, this proposed change maintains the alignment of the NBC with the Energy Efficiency Regulations, 2016 (EER), as amended by SOR/2022-265 (Amendment 17).

Amendment 17 generally presents two sets of performance requirements to the EER: the first that came into force on January 1, 2023, and the second that comes into force on January 1, 2025. Considering that the NBC 2025 will be published and adopted after January 1, 2025, these requirements, where applicable, should be included in the 2025 edition of the NBC.

PROPOSED CHANGE

NBC20 Div.B 9.36.3.10. (first printing)

[9.36.3.10.] 9.36.3.10. Equipment Efficiency

- [1] 1)** HVAC equipment and components shall comply with the performance requirements stated in Table 9.36.3.10. (See Note A-9.36.3.10.(1).)

**Table [9.36.3.10.] 9.36.3.10.
HVAC Equipment Performance Requirements
Forming Part of Sentences 9.36.3.9.(2) and [9.36.3.10.] 9.36.3.10.([1] 1)**

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
Air-Cooled Unitary Air Conditioners and Heat Pumps – Electrically Operated			
<u>Single-phase air conditioners and heat pumps, split-system</u>	<u>< 19</u>	<u>DOE 10 CFR, Part 430-2022, Subpart B, Appendix M1</u>	<u>SEER2 = 14.3 (2)</u>
			<u>HSPF2 V = 6 (2)</u>

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
Air conditioners and heat pumps, split-system	< 19	CSA C656	SEER = 14.5
			EER = 11.5
			HSPF V = 7.1
Single-phase air conditioners and heat pumps, single-package system	< 19	DOE 10 CFR, Part 430-2022, Subpart B, Appendix M1	SEER2 = 13.4 (2)
			HSPF V = 6.0 (2)
Air conditioners and heat pumps, single-package system	< 19	CSA C656	SEER = 14
			EER = 11
			HSPF V = 7.0
Heat pumps, split-system and single-package	≥ 19	See Tables 5.2.12.1.-A to -P of Division B of the NECB	
Air conditioners, all electrical phases, split-system and single-package	≥ 19	See Tables 5.2.12.1.-A to -P of Division B of the NECB	
Single-Package Vertical Air Conditioners (SPVAC) and Heat Pumps (SPVHP)			
SPVAC and SPVHP in cooling mode	< 19	CAN/CSA-C746	EER = 11
SPVAC and SPVHP in heating mode	< 19		$COP_h \geq 3.3$
SPVAC and SPVHP	≥ 19	See Tables 5.2.12.1.-A to -P of Division B of the NECB	
Water-Cooled Unitary Air Conditioners and Heat Pumps – Electrically Operated			
Ground-source and water-source heat pumps			
open loop	≤ 40	CAN/CSA-C13256-1	$COP_c \geq 4.75$, $COP_h \geq 3.6$
closed loop			$COP_c \geq 3.93$, $COP_h \geq 3.1$

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
Water-to-water heat pumps			
open loop	≤ 40	CAN/CSA-C13256-2	$COP_c \geq 5.60$, $COP_h \geq 3.4$
closed loop			$COP_c \geq 4.21$, $COP_h \geq 2.8$
Internal water-loop heat pumps	< 5	CAN/CSA-C13256-1	$COP_c \geq 3.28$, $COP_h \geq 4.2$
	≥ 5 and ≤ 40		$COP_c \geq 3.52$, $COP_h \geq 4.2$
Water-cooled air conditioners – all types	< 19	ANSI/AHRI 210/240	$COP = 3.54$, $ICOP = 3.60$
	≥ 19	See Tables 5.2.12.1.-A to -P of Division B of the NECB	
Direct-Expansion Ground-Source Heat Pumps – Electrically Operated			
Direct-expansion ground-source heat pumps	≤ 21	CSA C748	EER = 13.0
			$COP_h = 3.1$
Packaged Terminal Air Conditioners (PTAC) and Heat Pumps (PTHP)			
PTAC – all types and modes	All capacities	See Tables 5.2.12.1.-A to -P of Division B of the NECB	
PTHP – all types and modes			
Room Air Conditioners and Room Air Conditioner Heat Pumps			
Louvered, without reverse cycle	< 2.3	CSA C368.1	$CEER \geq 11.0$
	≥ 2.3 and < 4.1		$CEER \geq 10.9$
	≥ 4.1 and < 5.9		$CEER \geq 10.7$
	≥ 5.9 and < 8.2		$CEER \geq 9.4$
	≥ 8.2 and < 10.6		$CEER \geq 9.0$
Non-louvered, without reverse cycle	< 2.3		$CEER \geq 10.0$

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
	≥ 2.3 and < 3.2		CEER ≥ 9.6
	≥ 3.2 and < 4.1		CEER ≥ 9.5
	≥ 4.1 and < 5.9		CEER ≥ 9.3
	≥ 5.9 and < 10.6		CEER ≥ 9.4
Louvered, with reverse cycle	< 5.9		CEER ≥ 9.8
	≥ 5.9 and < 10.6		CEER ≥ 9.3
Non-louvered, with reverse cycle	< 4.1		CEER ≥ 9.3
	≥ 4.1 and < 10.6		CEER ≥ 8.7
Room air conditioner, casement only	All capacities		CEER ≥ 9.5
Room air conditioner, casement slider	All capacities		CEER ≥ 10.4
Boilers			
Electric <i>boilers</i>	< 88	—	Must be equipped with automatic water temperature control (3)
Gas-fired <i>boilers</i> (4)	< 88	CAN/CSA-P.2	AFUE $\geq 90\%$
	≥ 88 and < 733	ANSI/AHRI 1500 or DOE 10 CFR, Part 431, Subpart E, Appendix A	$E_t \geq 83\%$
Oil-fired <i>boilers</i>	< 88	CAN/CSA-P.2	AFUE $\geq 86\%$

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
	≥ 88 and ≤ 733	ANSI/AHRI 1500 or DOE 10 CFR, Part 431, Subpart E, Appendix A	$E_t \geq 83\%$
Warm-Air Furnaces, Combination Warm-Air Furnace/Air-conditioning Units, Duct Furnaces and Unit Heaters			
Gas-fired warm-air furnaces (4)	≤ 66 using single-phase electric current	CAN/CSA-P.2	AFUE $\geq 95\%$ and must be equipped with a high-efficiency constant torque or constant airflow fan motor
	≤ 66 , through-the-wall furnace		$E_t \geq 78.5\%$ AFUE $\geq 90\%$
	≤ 66 using three-phase electric current	ANSI Z21.47/CSA 2.3	AFUE $\geq 78\%$ or $E_t \geq 80\%$
	> 66 and ≤ 117.23		$E_t \geq 80\%$
Commercial gas-fired outdoor packaged furnaces (rooftop units) (4)	> 66 and ≤ 117.23	CAN/CSA-P.8	$E_t \geq 80\%$
Gas-fired duct furnaces (4)	≤ 117.23	ANSI Z83.8/CSA 2.6	$E_t \geq 81\%$
Gas-fired unit heaters (4)	≤ 117.23	CAN/CSA-P.11	$E_t \geq 82\%$
Oil-fired warm-air furnaces	≤ 66	CAN/CSA-P.2	AFUE $\geq 85\%$
Oil-fired duct furnaces and unit heaters	—	CSA B140.4	$E_t \geq 81\%$

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
Combined space- and water-heating systems (combos)	≤ 87.9 if boiler-based	CAN/CSA-P.9, (5)	TPF = 0.80
	≤ 73.2 if based on service water heater		
Integrated mechanical systems	All capacities	CSA P.10	OTPF = 0.85
Electric furnaces	≤ 66	No energy performance test required	Must be equipped with a high-efficiency constant torque or constant airflow fan motor
Other			
Gas-fired fireplaces and stoves (4) heating	—	CAN/CSA-P.4.1	FE ≥ 50%, see Sentence (2)
decorative (6) (7)			See Sentence (2)
Solid-fuel-burning space-heating equipment (8)	< 500 kW output capacity	EPA 40 CFR, Part 60, Subpart AAA, and Subpart QQQQ, CSA B415.1, or EN 303-5,	(9)
Dehumidifiers	≤ 16.6 L/day	CAN/CSA-C749	EF ≥ 1.35
	> 16.6 and ≤ 21.3 L/day		EF ≥ 1.50
	> 21.3 and ≤ 25.5 L/day		EF ≥ 1.60

Type of Equipment	Heating or Cooling Capacity, kW	Performance Testing Standard	Minimum Performance (1)
	> 25.5 and ≤ 35.5 L/day		EF ≥ 1.70
	> 35.5 and ≤ 87.5 L/day		EF ≥ 2.50
Unitary electric resistance space heaters (10)	All capacities	No energy performance test required	—

Notes to Table [9.36.3.10.] 9.36.3.10.:

- (1) The symbols and abbreviations that appear in this column have the following meanings:

AFUE	= annual fuel utilization efficiency
CEER	= combined energy-efficiency ratio, in (Btu/h)/W
COP _c	= coefficient of performance in cooling mode, in W/W
COP _h	= coefficient of performance in heating mode, in W/W
EER	= energy-efficiency ratio, in (Btu/h)/W
EF	= energy factor, in %/h
E _t	= thermal efficiency
FE	= fireplace efficiency
HSPF V	= heating seasonal performance factor for region V (see map in CSA C656), in (Btu/h)/W
<u>HSPF2 V</u>	<u>= heating seasonal performance factor 2 for region V (see map in DOE 10 CFR, Part 430-2022, Subpart B, Appendix M1), in (Btu/h)/W</u>
ICOP	= integrated coefficient of performance, in W/W
OTPF	= overall thermal performance factor
SEER	= seasonal energy-efficiency ratio, in (Btu/h)/W
<u>SEER2</u>	<u>= seasonal energy-efficiency ratio 2, in (Btu/h)/W</u>
TPF	= thermal performance factor

- (2) The SEER2 and HSPF2 V metrics are similar to the SEER and HSPF V metrics, respectively, but use different test conditions, as specified in DOE 10 CFR, Part 430-2022, "Energy, Energy Conservation Program for Consumer Products." For the purpose of compliance with the Code, either pair of performance metrics may be used.

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- (3) An automatic water temperature control device adjusts the temperature of the water in the *boiler* so that the heat supplied corresponds more closely to the heat demanded under varying outdoor temperatures.
 - (4) Includes propane.
 - (5) See Sentence (3).
 - (6) Decorative gas-fired fireplaces and *stoves* are vented decorative gas *appliances* that are marked as such on their rating plate and that comply with ANSI Z21.50/CSA 2.22, "Vented decorative gas appliances".
 - (7) Decorative gas-fired fireplaces and *stoves* shall not be used to satisfy heating requirements or as part of the heating system required by Section 9.33.
 - (8) Does not include *stoves* with an oven whose volume is greater than 0.028 m³.
 - (9) Minimum performance values are omitted from the Table in cases where the referenced standard itself contains such requirements. Equipment tested to the referenced standards provides an acceptable level of energy performance.
 - (10) See Sentence 9.36.3.6.(3).
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- [2] 2)** Natural gas and propane fireplaces shall be
- [a] a) direct-vent (sealed), and
 - [b] b) pilot-on-demand, interrupted or intermittent ignition systems without a standing pilot light.
- [3] 3)** The heat source component of combined space- and service water heating systems that are not within the scope of CAN/CSA-P.9, "Test method for determining the performance of combined space and water heating systems (combos)", shall meet the performance requirements stated in Table 9.36.3.10. for the applicable equipment type. (See Note A-9.36.3.10.(3).)

Impact analysis

This proposed change would help Code users and authorities having jurisdiction to assess whether equipment conforms to the Code.

This proposed change is expected to be cost neutral because it simply aligns the NBC requirements with the Canadian Energy Efficiency Regulations, 2016.

Enforcement implications

This proposed change would facilitate enforcement since the metrics used in the NBC would align with those of the Canadian Energy Efficiency Regulations, 2016 and the US Department of Energy, Energy Conservation Program for Consumer Products.

Who is affected

Designers, engineers, architects, manufacturers, builders, specification writers and building officials.

OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

NBC20 Div.B 9.36.3.10. (first printing)

[\[9.36.3.10.\]](#) 9.36.3.10. ([1] 1) [F95,F98,F99-OE1.1]

[\[9.36.3.10.\]](#) 9.36.3.10. ([2] 2) [F95,F98,F99-OE1.1]

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