Documents Relied Upon

For

2020 Repeal of Self-Contained Lighting Controls and Other Amendments

Docket No.20-AAER-01

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NEMA Standards Publication

ANSI C78.20-2003 (R2007, R2015)

American National Standard for Electric Lamps - A, G, PS and Similar Shapes with E26 Medium Screw Bases

National Electrical Manufacturers Association

American National Standard

ANSI C78.81-2003

American National Standard

for electric lamps—

Double-Capped Fluorescent Lamps—Dimensional and Electrical Characteristics

NEMA

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SECTION 110.9 – MANDATORY REQUIREMENTS FOR LIGHTING CONTROLS

(a) All lighting control devices and systems and all light sources subject to the requirements of Section 110.9 shall meet the following requirements:

1. Shall be installed only if the lighting control or light source complies with all of the applicable requirements of Section 110.9.
2. Lighting controls may be individual devices or systems consisting of two or more components.

(b) **All Lighting Controls.** Lighting controls listed in Section 110.9(b) shall comply with the requirements listed below; and all components of the system considered together as installed shall meet all applicable requirements for the application for which they are installed as required in Sections 130.0 through 130.5, Sections 140.6 through 140.8, Section 141.0, and Section 150.0(k).

1. **Time-Switch Lighting Controls.** All controls that provide time-switch functionality, including all automatic and astronomical time-switch controls, shall have program backup capabilities that prevent the loss of the device's schedule for at least 7 days, and the device's date and time for at least 72 hours if power is interrupted. In addition:

   A. Time-Switch Controls installed in nonresidential buildings shall

      i. For each connected load, be capable of providing manual override to each connected load and of resuming normally scheduled operation after a manual override is initiated within 2 hours; and

      ii. Provide an automatic holiday shutoff feature that turns off all connected loads for at least 24 hours and then resumes normally scheduled operation.

   B. Astronomical Time-Switch Controls shall:

      i. Have sunrise and sunset prediction accuracy within plus-or-minus 15 minutes and timekeeping accuracy within 5 minutes per year;

      ii. Be capable of displaying date, current time, sunrise time, sunset time, and switching times for each step during programming;

      iii. Be capable of automatically adjusting for daylight savings time; and

      iv. Have the ability to independently offset the on and off for each channel by at least 90 minutes before and after sunrise or sunset.

   C. Multilevel Time-Switch Controls shall include at least two separately programmable steps per zone.

   D. Time-Switch Controls installed outdoors shall have setback functions that allow the lighting on each controlled channel to be switched or dimmed to lower levels. The set back functions shall be capable of being programmed by the user for at least one specific time of day.

2. **Daylighting Controls.** Controls that provide automatic daylighting functionality shall:

   A. Automatically return to its most recent time delay settings within 60 minutes of the last received input when left in calibration mode;

   B. Have a set point control that easily distinguishes settings to within 10 percent of full scale adjustment;

   C. Provide a linear response within 5 percent accuracy over the range of illuminance measured by the light sensor; and

   D. Be capable of being calibrated in a manner that the person initiating the calibration is remote from the sensor during calibration to avoid influencing calibration accuracy, for example by having a light sensor that is physically separated from where the calibration adjustments are made.

3. **Dimmers.** Controls that provide dimming functionality shall:

   A. Be capable of reducing lighting power consumption by a minimum of 65% when at its lowest setting;

B. Provide reduced flicker operation, meaning that directly controlled light sources shall be provided electrical power such that the light output has an amplitude modulation of less than 30 percent for frequencies less than 200 Hz without causing premature lamp failure;

C. Provide an off setting that produces a zero lumen output; and

D. For wall box dimmers and associated switches designed for use in three way circuits, be capable of turning lights off, and on to the level set by the dimmer if the lights are off.

4. **Occupant Sensing Controls.** Occupant sensing controls include occupant sensors, motion sensors, and vacancy sensors, including those with a Partial-ON or Partial-OFF function. Occupant sensing controls shall:

   A. Be capable of automatically turning the controlled lights in the area either off or down no more than 20 minutes after the area has been vacated;

   B**.** For manual-on controls, have a grace period of no less than 15 seconds and no more than 30 seconds to turn on lighting automatically after the sensor has timed out; and

   C. Provide a visible status signal that indicates that the device is operating properly, or that it has failed or malfunctioned. The visible status signal may have an override that turns off the signal**.**

   EXCEPTION to Section 110.9(b)4: Occupant Sensing Control systems may consist of a combination of single or multilevel Occupant, Motion, or Vacancy Sensor Controls, provided that components installed to comply with manual-on requirements shall not be capable of conversion by occupants from manual-on to automatic-on functionality.

5. **Part-Night Outdoor Lighting Controls**, as defined in Section 100.1, shall meet all of the following requirements:

   A. Have sunrise and sunset prediction accuracy within +/- 15 minutes, using both light sensing and time measurement; and

   B. Have the ability to reduce or turn off outdoor luminaire power at night as required in Section 130.2(c) ; and

   C. Shall be programmable to reduce or turn off outdoor luminaire power at any time as determined by the user. Time-based scheduling control is allowed to be relative to both sunset and sunrise, and to the midpoint between sunset and sunrise.

6. **Sensors used to detect occupants.** Sensors that are used by occupant sensing controls to detect occupants shall meet all of the following requirements:

   A. Sensors shall not incorporate switches or mechanical devices that allow the sensor to be disabled without changing the settings of the control.

   B. Sensors that utilize ultrasonic radiation for detection of occupants shall:

      i. comply with 21 C.F.R. part 1002.12;

      ii. not emit audible sound; and

      iii. not emit ultrasound in excess of the decibel levels shown in Table 110.9-A measured no more than five feet from the source, on axis.

   C. Sensors that utilize microwave radiation for detection of occupants shall:

      i. comply with 47 C.F.R. parts 2 and 15; and

      ii. not emit radiation in excess of 1 milliwatt per square centimeter measured at no more than 5 centimeters from the emission surface of the device.

7. **Indicator Lights.** Indicator lights integral to lighting controls shall consume no more than one watt of power per indicator light.

(c) **Track Lighting Integral Current Limiter.** An integral current limiter for line-voltage track lighting shall be recognized for compliance with Part 6 only if it meets all of the following requirements:

1. Shall have the identical volt-ampere (VA) rating of the current limiter, as installed and rated for compliance with Part 6 clearly marked as follows; and:
   A. So that it is visible for the enforcement agency's field inspection without opening coverplates, fixtures, or panels; and
   B. Permanently marked on the circuit breaker; and
   C. On a factory-printed label that is permanently affixed to a nonremovable base-plate inside the wiring compartment.
2. Shall have a conspicuous factory installed label permanently affixed to the inside of the wiring compartment warning against removing, tampering with, rewiring, or bypassing the device; and
3. Each electrical panel from which track lighting integral current limiters are energized shall have a factory printed label permanently affixed and prominently located, stating the following: "NOTICE: Current limiting devices installed in track lighting integral current limiters connected to this panel shall only be replaced with the same or lower amperage. Adding track or replacement of existing current limiters with higher continuous ampere rating will void the track lighting integral current limiter certification, and will require resubmittal of compliance documentation to the enforcement agency responsible for compliance with the California Title 24, Part 6 Building Energy Efficiency Standards."

(d) **Track Lighting Supplementary Overcurrent Protection Panel.** A Track Lighting Supplementary Overcurrent Protection Panel shall be used only for line-voltage track lighting and shall be recognized for compliance with Part 6 only if it meets all of the following requirements:

1. Shall be listed as defined in Section 100.1; and
2. Shall have a permanently installed label that is prominently located stating the following: "NOTICE: This Panel for Track Lighting Energy Code Compliance Only. The overcurrent protection devices in this panel shall only be replaced with the same or lower amperage. No other overcurrent protective device shall be added to this panel. Adding to, or replacement of existing overcurrent protective device(s) with higher continuous ampere rating, will void the panel listing and require resubmittal of compliance documentation to the enforcement agency responsible for compliance with the California Title 24, Part 6 Building Energy Efficiency Standards."

TABLE 110.9-A - ULTRASOUND MAXIMUM DECIBEL VALUES

Mid-frequency of Sound Pressure Third-Octave Band (in kHz)	**Maximum db Level within Third-Octave Band (in dB reference 20 micropascals)**
Less than 20	80
20 or more to less than 25	105
25 or more to less than 31.5	110
31.5 or more	115

NOTE: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, and 52943, Public Resources Code

Title 10: Energy
PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

Appendix BB to Subpart B of Part 430—Uniform Test Method for Measuring the Input Power, Lumen Output, Lamp Efficacy, Correlated Color Temperature (CCT), Color Rendering Index (CRI), Power Factor, Time to Failure, and Standby Mode Power of Integrated Light-Emitting Diode (LED) Lamps

Note: On or after March 20, 2019, any representations made with respect to the energy use or efficiency of integrated light-emitting diode lamps must be made in accordance with the results of testing pursuant to this appendix.

1. *Scope:* This appendix specifies the test methods required to measure input power, lumen output, lamp efficacy, CCT, CRI, power factor, time to failure, and standby mode power for integrated LED lamps.

2. Definitions

2.1. The definitions specified in section 1.3 of IES LM-79-08 except section 1.3(f) (incorporated by reference; see §430.3) apply.

2.2. *Initial lumen output* means the measured lumen output after the lamp is initially energized and stabilized using the stabilization procedures in section 3 of this appendix.

2.3. *Interval lumen output* means the measured lumen output at constant intervals after the initial lumen output measurement in accordance with section 4 of this appendix.

2.4. *Rated input voltage* means the voltage(s) marked on the lamp as the intended operating voltage. If not marked on the lamp, assume 120 V.

2.5. *Test duration* means the operating time of the LED lamp after the initial lumen output measurement and before, during, and including the final lumen output measurement, in units of hours.

2.6. *Time to failure* means the time elapsed between the initial lumen output measurement and the point at which the lamp reaches 70 percent lumen maintenance as measured in section 4 of this appendix.

3. Active Mode Test Method for Determining Lumen Output, Input Power, CCT, CRI, Power Factor, and Lamp Efficacy

Factor, and Lamp Efficacy

In cases where there is a conflict, the language of the test procedure in this appendix takes precedence over IES LM-79-08 (incorporated by reference; see §430.3).

3.1. Test Conditions and Setup

3.1.1. Establish the ambient conditions, power supply, electrical settings, and instrumentation in accordance with the specifications in sections 2.0, 3.0, 7.0, and 8.0 of IES LM-79-08 (incorporated by reference; see §430.3), respectively.

3.1.2. Position an equal number of integrated LED lamps in the base-up and base-down orientations throughout testing; if the position is restricted by the manufacturer, test units in the manufacturer-specified position.

3.1.3. Operate the integrated LED lamp at the rated voltage throughout testing. For an integrated LED lamp with multiple rated voltages including 120 volts, operate the lamp at 120 volts. If an integrated LED lamp with multiple rated voltages is not rated for 120 volts, operate the lamp at the highest rated input voltage. Additional tests may be conducted at other rated voltages.

3.1.4. Operate the lamp at the maximum input power. If multiple modes occur at the same maximum input power (such as variable CCT or CRI), the manufacturer can select any of these modes for testing; however, all measurements described in sections 3 and 4 of this appendix must be taken at the same selected mode. The test report must indicate which mode was selected for testing and include detail such that another laboratory could operate the lamp in the same mode.

3.2. Test Method, Measurements, and Calculations

3.2.1. The test conditions and setup described in section 3.1 of this appendix apply to this section 3.2.

3.2.2. Stabilize the integrated LED lamp prior to measurement as specified in section 5.0 of IES LM-79-08 (incorporated by reference; see §430.3). Calculate the stabilization variation as [(maximum—minimum)/minimum] of at least three readings of the input power and lumen output over a period of 30 minutes, taken 15 minutes apart.

3.2.3. Measure the input power in watts as specified in section 8.0 of IES LM-79-08.

3.2.4. Measure the input voltage in volts as specified in section 8.0 of IES LM-79-08.

3.2.5. Measure the input current in amps as specified in section 8.0 of IES LM-79-08.

3.2.6. Measure lumen output as specified in section 9.1 and 9.2 of IES LM-79-08. Do not use goniophotometers.

3.2.7. Determine CCT according to the method specified in section 12.0 of IES LM-79-08 with the exclusion of section 12.2 and 12.5 of IES LM-79-08. Do not use goniophotometers.

3.2.8. Determine CRI according to the method specified in section 12.0 of IES LM-79-08 with the exclusion of section 12.2 and 12.5 of IES LM-79-08. Do not use goniophotometers.

3.2.9. Determine lamp efficacy by dividing measured initial lumen output by the measured input power.

3.2.10. Determine power factor for AC-input lamps by dividing measured input power by the product of the measured input voltage and measured input current.

4. Active Mode Test Method to Measure Time to Failure

In cases where there is a conflict, the language of the test procedure in this appendix takes precedence over IES LM-84 (incorporated by reference; see §430.3) and IES TM-28 (incorporated by reference; see §430.3).

4.1. Lamp Handling, Tracking, and Time Recording

4.1.1. Handle, transport, and store the integrated LED lamp as described in section 7.2 of IES LM-84 (incorporated by reference; see §430.3).

4.1.2. Mark and track the integrated LED lamp as specified in section 7.3 of IES LM-84.

4.1.3. Measure elapsed operating time and calibrate all equipment as described in section 7.5 of IES LM-84.

4.1.4. Check the integrated LED lamps regularly for failure as specified in section 7.8 of IES LM-84.

4.2. *Measure Initial Lumen Output.* Measure the initial lumen output according to section 3 of this appendix.

4.3. *Test Duration.* Operate the integrated LED lamp for a period of time (the test duration) after the initial lumen output measurement and before, during, and including the final lumen output measurement.

4.3.1. There is no minimum test duration requirement for the integrated LED lamp. The test duration is selected by the manufacturer. See section 4.6 of this appendix for instruction on the maximum time to failure.

4.3.2. The test duration only includes time when the integrated LED lamp is energized and operating.

4.4. Operating Conditions and Setup Between Lumen Output Measurements

4.4.1. Electrical settings must be as described in section 5.1 of IES LM-84 (incorporated by reference; see §430.3).

4.4.2. LED lamps must be handled and cleaned as described in section 4.1 of IES LM-84.

4.4.3. Vibration around each lamp must be as described in section 4.3 of IES LM-84.

4.4.4. Ambient temperature conditions must be as described in section 4.4 of IES LM-84. Maintain the ambient temperature at 25 °C ± 5 °C or at a manufacturer-selected temperature higher than 25 °C with the same ±5 °C tolerance.

4.4.5. Humidity in the testing environment must be as described in section 4.5 of IES LM-84.

4.4.6. Air movement around each lamp must be as described in section 4.6 of IES LM-84.

4.4.7. Position a lamp in either the base-up and base-down orientation throughout testing. An equal number of lamps in the sample must be tested in the base-up and base-down orientations, except that, if the manufacturer restricts the position, test all of the units in the sample in the manufacturer-specified position.

4.4.8. Operate the lamp at the rated input voltage as described in section 3.1.3 of this appendix for the entire test duration.

4.4.9. Operate the lamp at the maximum input power as described in section 3.1.4 of this appendix for the entire test duration.

4.4.10. Line voltage waveshape must be as described in section 5.2 of IES LM-84.

4.4.11. Monitor and regulate rated input voltage as described in section 5.4 of IES LM-84.

4.4.12. Wiring of test racks must be as specified in section 5.5 of IES LM-84.

4.4.13. Operate the integrated LED lamp continuously.

4.5. Measure Interval Lumen Output. Measure interval lumen output according to section 3 of this appendix.

4.5.1. Record interval lumen output and elapsed operating time as described in section 4.2 of IES TM-28 (incorporated by reference; see §430.3).

4.5.1.1. For test duration values greater than or equal to 3,000 hours and less than 6,000 hours, measure lumen maintenance of the integrated LED lamp at an interval in accordance with section 4.2.2 of IES TM-28.

4.5.1.2. For test duration values greater than or equal to 6,000 hours, measure lumen maintenance at an interval in accordance with section 4.2.1 of IES TM-28.

4.6. Calculate Lumen Maintenance and Time to Failure

4.6.1. Calculate the lumen maintenance of the lamp at each interval by dividing the interval lumen output “x_t” by the initial lumen output “x_0”. Measure initial and interval lumen

output in accordance with sections 4.2 and 4.5 of this appendix, respectively.

4.6.2. For lumen maintenance values less than 0.7, including lamp failures that result in complete loss of light output, time to failure is equal to the previously recorded lumen output measurement (at a shorter test duration) where the lumen maintenance is greater than or equal to 0.7.

4.6.3. For lumen maintenance values equal to 0.7, time to failure is equal to the test duration.

4.6.4. For lumen maintenance values greater than 0.7, use the following method:

4.6.4.1. For test duration values less than 3,000 hours, do not project time to failure. Time to failure equals the test duration.

4.6.4.2. For test duration values greater than or equal to 3,000 hours but less than 6,000 hours, time to failure is equal to the lesser of the projected time to failure calculated according to section 4.6.4.2.1 of this appendix or the test duration multiplied by the limiting multiplier calculated in section 4.6.4.2.2 of this appendix.

4.6.4.2.1. Project time to failure using the projection method described in section 5.1.4 of IES TM-28 (incorporated by reference; see §430.3). Project time to failure for each individual LED lamp. Do not use data obtained prior to a test duration value of 1,000 hours.

4.6.4.2.2. Calculate the limiting multiplier from the following equation:

$$Limiting\ multiplier = \frac{1}{600} * test\ duration - 4$$

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4.6.4.3. For test duration values greater than 6,000 hours, time to failure is equal to the lesser of the projected time to failure calculated according to section 4.6.4.3.1 or the test duration multiplied by six.

4.6.4.3.1. Project time to failure using the projection method described in section 5.1.4 of IES TM-28 (incorporated by reference; see §430.3). Project time to failure for each individual LED lamp. Data used for the time to failure projection method must be as specified in section 5.1.3 of IES TM-28.

5. Standby Mode Test Method for Determining Standby Mode Power

Measure standby mode power consumption for integrated LED lamps capable of operating in standby mode. The standby mode test method in this section 5 may be completed before or after the active mode test method for determining lumen output, input power, CCT, CRI, power factor, and lamp efficacy in section 3 of this appendix. The standby mode test method in this section 5 must be completed before the active mode test method for determining time to failure in section 4 of this appendix. In cases where there is a conflict, the language of the test procedure in this appendix takes precedence over IES LM-79

(incorporated by reference; see §430.3) and IEC 62301 (incorporated by reference; see §430.3).

5.1. Test Conditions and Setup

5.1.1. Establish the ambient conditions, power supply, electrical settings, and instrumentation in accordance with the specifications in sections 2.0, 3.0, 7.0, and 8.0 of IES LM-79 (incorporated by reference; see §430.3), respectively. Maintain the ambient temperature at 25 °C ± 1 °C.

5.1.2. Position a lamp in either the base-up and base-down orientation throughout testing. An equal number of lamps in the sample must be tested in the base-up and base-down orientations.

5.1.3. Operate the integrated LED lamp at the rated voltage throughout testing. For an integrated LED lamp with multiple rated voltages, operate the integrated LED lamp at 120 volts. If an integrated LED lamp with multiple rated voltages is not rated for 120 volts, operate the integrated LED lamp at the highest rated input voltage.

5.2. Test Method, Measurements, and Calculations

5.2.1. The test conditions and setup described in section 3.1 of this appendix apply to this section.

5.2.2. Connect the integrated LED lamp to the manufacturer-specified wireless control network (if applicable) and configure the integrated LED lamp in standby mode by sending a signal to the integrated LED lamp instructing it to have zero light output. Lamp must remain connected to the network throughout the duration of the test.

5.2.3. Stabilize the integrated LED lamp as specified in section 5 of IEC 62301 (incorporated by reference; see §430.3) prior to measurement.

5.2.4. Measure the standby mode power in watts as specified in section 5 of IEC 62301.

[81 FR 43427, July 1, 2016, as amended at 83 FR 47812, Sept. 21, 2018]

ELECTRONIC CODE OF FEDERAL REGULATIONS

e-CFR data is current as of July 6, 2020

Title 10: Energy
PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS
Subpart C—Energy and Water Conservation Standards

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§430.32 Energy and water conservation standards and their compliance dates.

The energy and water (in the case of faucets, showerheads, water closets, and urinals) conservation standards for the covered product classes are:

(a) *Refrigerators/refrigerator-freezers/freezers.* These standards do not apply to refrigerators and refrigerator-freezers with total refrigerated volume exceeding 39 cubic feet (1104 liters) or freezers with total refrigerated volume exceeding 30 cubic feet (850 liters). The energy standards as determined by the equations of the following table(s) shall be rounded off to the nearest kWh per year. If the equation calculation is halfway between the nearest two kWh per year values, the standard shall be rounded up to the higher of these values.

The following standards remain in effect from July 1, 2001 until September 15, 2014:

Product class	Energy standard equations for maximum energy use (kWh/yr)
1. Refrigerators and refrigerator-freezers with manual defrost	8.82AV + 248.4 0.31av + 248.4
2. Refrigerator-freezers—partial automatic defrost	8.82AV + 248.4 0.31av + 248.4
3. Refrigerator-freezers—automatic defrost with top-mounted freezer without through-the-door ice service and all-refrigerator—automatic defrost	9.80AV + 276.0 0.35av + 276.0
4. Refrigerator-freezers—automatic defrost with side-mounted freezer without through-the-door ice service	4.91AV + 507.5 0.17av + 507.5
5. Refrigerator-freezers—automatic defrost with bottom-mounted freezer without through-the-door ice service	4.60AV + 459.0 0.16av + 459.0
6. Refrigerator-freezers—automatic defrost with top-mounted freezer with through-the-door ice service	10.20AV + 356.0 0.36av + 356.0
7. Refrigerator-freezers—automatic defrost with side-mounted freezer with through-the-door ice service	10.10AV + 406.0 0.36av + 406.0
8. Upright freezers with manual defrost	7.55AV + 258.3 0.27av + 258.3
9. Upright freezers with automatic defrost	12.43AV + 326.1 0.44av + 326.1
10. Chest freezers and all other freezers except compact freezers	9.88AV + 143.7 0.35av + 143.7
11. Compact refrigerators and refrigerator-freezers with manual defrost	10.70AV + 299.0 0.38av + 299.0

	0.38av + 299.0
12. Compact refrigerator-freezer—partial automatic defrost	7.00AV + 398.0 0.25av + 398.0
13. Compact refrigerator-freezers—automatic defrost with top-mounted freezer and compact all-refrigerator—automatic defrost	12.70AV + 355.0 0.45av + 355.0
14. Compact refrigerator-freezers—automatic defrost with side-mounted freezer	7.60AV + 501.0 0.27av + 501.0
15. Compact refrigerator-freezers—automatic defrost with bottom-mounted freezer	13.10AV + 367.0 0.46av + 367.0
16. Compact upright freezers with manual defrost	9.78AV + 250.8 0.35av + 250.8
17. Compact upright freezers with automatic defrost	11.40AV + 391.0 0.40av + 391.0
18. Compact chest freezers	10.45AV + 152.0 0.37av + 152.0

AV: Adjusted Volume in ft^3; av: Adjusted Volume in liters (L).

The following standards apply to products manufactured starting on September 15, 2014:

Product class	**Equations for maximum energy use (kWh/yr)**	
	Based on AV (ft^3)	**Based on av (L)**
1. Refrigerator-freezers and refrigerators other than all-refrigerators with manual defrost	7.99AV + 225.0	0.282av + 225.0
1A. All-refrigerators—manual defrost	6.79AV + 193.6	0.240av + 193.6
2. Refrigerator-freezers—partial automatic defrost	7.99AV + 225.0	0.282av + 225.0
3. Refrigerator-freezers—automatic defrost with top-mounted freezer without an automatic icemaker	8.07AV + 233.7	0.285av + 233.7
3-BI. Built-in refrigerator-freezer—automatic defrost with top-mounted freezer without an automatic icemaker	9.15AV + 264.9	0.323av + 264.9
3I. Refrigerator-freezers—automatic defrost with top-mounted freezer with an automatic icemaker without through-the-door ice service	8.07AV + 317.7	0.285av + 317.7
3I-BI. Built-in refrigerator-freezers—automatic defrost with top-mounted freezer with an automatic icemaker without through-the-door ice service	9.15AV + 348.9	0.323av + 348.9
3A. All-refrigerators—automatic defrost	7.07AV + 201.6	0.250av + 201.6
3A-BI. Built-in All-refrigerators—automatic defrost	8.02AV + 228.5	0.283av + 228.5
4. Refrigerator-freezers—automatic defrost with side-mounted freezer without an automatic icemaker	8.51AV + 297.8	0.301av + 297.8
4-BI. Built-In Refrigerator-freezers—automatic defrost with side-mounted freezer without an automatic icemaker	10.22AV + 357.4	0.361av + 357.4
4I. Refrigerator-freezers—automatic defrost with side-mounted freezer with an automatic icemaker without through-the-door ice service	8.51AV + 381.8	0.301av + 381.8
4I-BI. Built-In Refrigerator-freezers—automatic defrost with side-mounted freezer with an automatic icemaker without through-the-door ice service	10.22AV + 441.4	0.361av + 441.4
5. Refrigerator-freezers—automatic defrost with bottom-mounted freezer without an automatic icemaker	8.85AV + 317.0	0.312av + 317.0
5-BI. Built-In Refrigerator-freezers—automatic defrost with bottom-mounted freezer without an automatic icemaker	9.40AV + 336.9	0.332av + 336.9
5I. Refrigerator-freezers—automatic defrost with bottom-mounted freezer with an automatic icemaker without through-the-door ice service	8.85AV + 401.0	0.312av + 401.0

5I-BI. Built-In Refrigerator-freezers—automatic defrost with bottom-mounted freezer with an automatic icemaker without through-the-door ice service	9.40AV + 420.9	0.332av + 420.9
5A. Refrigerator-freezer—automatic defrost with bottom-mounted freezer with through-the-door ice service	9.25AV + 475.4	0.327av + 475.4
5A-BI. Built-in refrigerator-freezer—automatic defrost with bottom-mounted freezer with through-the-door ice service	9.83AV + 499.9	0.347av + 499.9
6. Refrigerator-freezers—automatic defrost with top-mounted freezer with through-the-door ice service	8.40AV + 385.4	0.297av + 385.4
7. Refrigerator-freezers—automatic defrost with side-mounted freezer with through-the-door ice service	8.54AV + 432.8	0.302av + 432.8
7-BI. Built-In Refrigerator-freezers—automatic defrost with side-mounted freezer with through-the-door ice service	10.25AV + 502.6	0.362av + 502.6
8. Upright freezers with manual defrost	5.57AV + 193.7	0.197av + 193.7
9. Upright freezers with automatic defrost without an automatic icemaker	8.62AV + 228.3	0.305av + 228.3
9I. Upright freezers with automatic defrost with an automatic icemaker	8.62AV + 312.3	0.305av + 312.3
9-BI. Built-In Upright freezers with automatic defrost without an automatic icemaker	9.86AV + 260.9	0.348av + 260.9
9I-BI. Built-in upright freezers with automatic defrost with an automatic icemaker	9.86AV + 344.9	0.348av + 344.9
10. Chest freezers and all other freezers except compact freezers	7.29AV + 107.8	0.257av + 107.8
10A. Chest freezers with automatic defrost	10.24AV + 148.1	0.362av + 148.1
11. Compact refrigerator-freezers and refrigerators other than all-refrigerators with manual defrost	9.03AV + 252.3	0.319av + 252.3
11A.Compact all-refrigerators—manual defrost	7.84AV + 219.1	0.277av + 219.1
12. Compact refrigerator-freezers—partial automatic defrost	5.91AV + 335.8	0.209av + 335.8
13. Compact refrigerator-freezers—automatic defrost with top-mounted freezer	11.80AV + 339.2	0.417av + 339.2
13I. Compact refrigerator-freezers—automatic defrost with top-mounted freezer with an automatic icemaker	11.80AV + 423.2	0.417av + 423.2
13A. Compact all-refrigerators—automatic defrost	9.17AV + 259.3	0.324av + 259.3
14. Compact refrigerator-freezers—automatic defrost with side-mounted freezer	6.82AV + 456.9	0.241av + 456.9
14I. Compact refrigerator-freezers—automatic defrost with side-mounted freezer with an automatic icemaker	6.82AV + 540.9	0.241av + 540.9
15. Compact refrigerator-freezers—automatic defrost with bottom-mounted freezer	11.80AV + 339.2	0.417av + 339.2
15I. Compact refrigerator-freezers—automatic defrost with bottom-mounted freezer with an automatic icemaker	11.80AV + 423.2	0.417av + 423.2
16. Compact upright freezers with manual defrost	8.65AV + 225.7	0.306av + 225.7
17. Compact upright freezers with automatic defrost	10.17AV + 351.9	0.359av + 351.9
18. Compact chest freezers	9.25AV + 136.8	0.327av + 136.8

AV = Total adjusted volume, expressed in ft^3, as determined in appendices A and B of subpart B of this part.

av = Total adjusted volume, expressed in Liters.

(2) The length of the trough-type urinal in inches (millimeter) divided by 16 inches (406 millimeters).

(s) *Ceiling fans and ceiling fan light kits.* (1) All ceiling fans manufactured on or after January 1, 2007, shall have the following features:

(i) Fan speed controls separate from any lighting controls;

(ii) Adjustable speed controls (either more than 1 speed or variable speed);

(iii) The capability of reversible fan action, except for—

(A) Fans sold for industrial applications;

(B) Fans sold for outdoor applications; and

(C) Cases in which safety standards would be violated by the use of the reversible mode.

(2)(i) Ceiling fans manufactured on or after January 21, 2020 shall meet the requirements shown in the table:

Product class as defined in Appendix U	**Minimum efficiency (CFM/W)[1]**
Very small-diameter (VSD)	D ≤ 12 in.: 21 D > 12 in.: 3.16 D −17.04
Standard	0.65 D + 38.03
Hugger	0.29 D + 34.46
High-speed small-diameter (HSSD)	4.16 D + 0.02
Large-diameter	0.91 D−30.00

[1]D is the ceiling fan's blade span, in inches, as determined in Appendix U of this part.

(ii) The provisions in this appendix apply to ceiling fans except:

(A) Ceiling fans where the plane of rotation of a ceiling fan's blades is not less than or equal to 45 degrees from horizontal, or cannot be adjusted based on the manufacturer's specifications to be less than or equal to 45 degrees from horizontal;

(B) Centrifugal ceiling fans, as defined in Appendix U of this part;

(C) Belt-driven ceiling fans, as defined in Appendix U of this part;

(D) Oscillating ceiling fans, as defined in Appendix U of this part; and

(E) Highly-decorative ceiling fans, as defined in Appendix U of this part.

(3) Ceiling fan light kits manufactured on or after January 1, 2007, and prior to January 21, 2020, with medium screw base sockets must be packaged with medium screw base lamps to fill all sockets. These medium screw base lamps must—

(i) Be compact fluorescent lamps that meet or exceed the following requirements or be as described in paragraph (s)(3)(ii) of this section:

Factor	Requirements
Rated Wattage (Watts) & Configuration[1]	Minimum Initial Lamp Efficacy (lumens per watt)[2]
Bare Lamp:	
Lamp Power <15	45.0
Lamp Power ≥15	60.0
Covered Lamp (no reflector):	
Lamp Power <15	40.0
15≤Lamp Power <19	48.0
19≤Lamp Power <25	50.0
Lamp Power ≥25	55.0
With Reflector:	
Lamp Power <20	33.0
Lamp Power ≥20	40.0
Lumen Maintenance at 1,000 hours	≥ 90.0%
Lumen Maintenance at 40 Percent of Lifetime	≥ 80.0%
Rapid Cycle Stress Test	Each lamp must be cycled once for every 2 hours of lifetime. At least 5 lamps must meet or exceed the minimum number of cycles.
Lifetime	≥ 6,000 hours for the sample of lamps.

[1]Use rated wattage to determine the appropriate minimum efficacy requirements in this table.

[2]Calculate efficacy using measured wattage, rather than rated wattage, and measured lumens to determine product compliance. Wattage and lumen values indicated on products or packaging may not be used in calculation.

(ii) Be light sources other than compact fluorescent lamps that have lumens per watt performance at least equivalent to comparably configured compact fluorescent lamps meeting the energy conservation standards in paragraph (s)(3)(i) of this section.

(4) Ceiling fan light kits manufactured on or after January 1, 2007, and prior January 21, 2020, with pin-based sockets for fluorescent lamps must use an electronic ballast and be packaged with lamps to fill all sockets. These lamp ballast platforms must meet the following requirements:

Factor	Requirement
System Efficacy Per Lamp Ballast Platform in Lumens Per Watt (lm/w)	≥50 lm/w for all lamps below 30 total listed lamp watts.
	≥60 lm/w for all lamps that are ≤ 24 inches and
	≥30 total listed lamp watts.
	≥70 lm/w for all lamps that are > 24 inches and
	≥30 total listed lamp watts.

(5) Ceiling fan light kits manufactured on or after January 1, 2009, and prior to January 21, 2020, with socket types other than those covered in paragraph (s)(3) or (4) of this

section, including candelabra screw base sockets, must be packaged with lamps to fill all sockets and must not be capable of operating with lamps that total more than 190 watts.

(6) Ceiling fan light kits manufactured on or after January 21, 2020 must be packaged with lamps to fill all sockets, and each basic model of lamp packaged with the basic model of CFLK and each basic model of integrated SSL in the CFLK basic model shall meet the requirements shown in the table:

Lumens[1]	**Minimum required efficacy (lm/W)**
<120	50
≥120	$(74.0-29.42 \times 0.9983^{lumens})$

[1]Use the lumen output for each basic model of lamp packaged with the basic model of CFLK or each basic model of integrated SSL in the CFLK basic model to determine the applicable standard.

(i) Ceiling fan light kits with medium screw base sockets manufactured on or after January 21, 2020 and packaged with compact fluorescent lamps must include lamps that also meet the following requirements:

Lumen Maintenance at 1,000 hours	≥90.0%.
Lumen Maintenance at 40 Percent of Lifetime	≥80.0%.
Rapid Cycle Stress Test	Each lamp must be cycled once for every 2 hours of lifetime of compact fluorescent lamp as defined in §430.2. At least 5 lamps must meet or exceed the minimum number of cycles.
Lifetime	≥6,000 hours for the sample of lamps.

(ii) Ceiling fan light kits with pin based sockets for fluorescent lamps, manufactured on or after January 21, 2020, must also use an electronic ballast.

(t) *Torchieres.* A torchiere manufactured on or after January 1, 2006 shall:

(1) Consume not more than 190 watts of power; and

(2) Not be capable of operating with lamps that total more than 190 watts.

(u) *Compact fluorescent lamps.* (1) Medium Base Compact Fluorescent Lamps. A bare or covered (no reflector) medium base compact fluorescent lamp manufactured on or after January 1, 2006, must meet the following requirements:

Factor	**Requirements**
Labeled Wattage (Watts) & Configuration*	Measured initial lamp efficacy (lumens per watt) must be at least:
Bare Lamp:	
Labeled Wattage < 15	45.0.
Labeled Wattage ≥ 15	60.0.
Covered Lamp (no reflector):	
Labeled Wattage < 15	40.0.

1490-2600	72	1,000 hrs	1/1/2012
1050-1489	53	1,000 hrs	1/1/2013
750-1049	43	1,000 hrs	1/1/2014
310-749	29	1,000 hrs	1/1/2014

(B) Modified spectrum general service incandescent lamps manufactured after the effective dates specified shall have a color rendering index greater than or equal to 75 and shall have a rated wattage no greater than and rated lifetime no less than the values shown in the table below:

Modified Spectrum General Service Incandescent Lamps

Rated lumen ranges	Maximum rate wattage	Minimum rate life-time	Effective date
1118-1950	72	1,000 hrs	1/1/2012
788-1117	53	1,000 hrs	1/1/2013
563-787	43	1,000 hrs	1/1/2014
232-562	29	1,000 hrs	1/1/2014

(2) Each candelabra base incandescent lamp shall not exceed 60 rated watts.

(3) Each intermediate base incandescent lamp shall not exceed 40 rated watts.

(y) *Residential furnace fans.* Residential furnace fans incorporated in the products listed in Table 1 of this paragraph and manufactured on and after July 3, 2019, shall have a fan energy rating (FER) value that meets or is less than the following values:

Table 1—Energy Conservation Standards for Covered Residential Furnace Fans*

Product class	FER** (Watts/1000 cfm)
Non-Weatherized, Non-Condensing Gas Furnace Fan (NWG-NC)	FER = 0.044 × Q_{Max} + 182
Non-Weatherized, Condensing Gas Furnace Fan (NWG-C)	FER = 0.044 × Q_{Max} + 195
Weatherized Non-Condensing Gas Furnace Fan (WG-NC)	FER = 0.044 × Q_{Max} + 199
Non-Weatherized, Non-Condensing Oil Furnace Fan (NWO-NC)	FER = 0.071 × Q_{Max} + 382
Non-Weatherized Electric Furnace/Modular Blower Fan (NWEF/NWMB)	FER = 0.044 × Q_{Max} + 165
Mobile Home Non-Weatherized, Non-Condensing Gas Furnace Fan (MH-NWG-NC)	FER = 0.071 × Q_{Max} + 222
Mobile Home Non-Weatherized, Condensing Gas Furnace Fan (MH-NWG-C)	FER = 0.071 × Q_{Max} + 240
Mobile Home Electric Furnace/Modular Blower Fan (MH-EF/MB)	FER = 0.044 × Q_{Max} + 101
Mobile Home Non-Weatherized Oil Furnace Fan (MH-NWO)	Reserved
Mobile Home Weatherized Gas Furnace Fan (MH-WG)**	Reserved

*Furnace fans incorporated into hydronic air handlers, SDHV modular blowers, SDHV electric furnaces, and CAC/HP indoor units are not subject to the standards listed in this table.

**Q_{Max} is the airflow, in cfm, at the maximum airflow-control setting measured using the final DOE test procedure at 10 CFR part 430, subpart B, appendix AA.

Title 10: Energy
PART 431—ENERGY EFFICIENCY PROGRAM FOR CERTAIN COMMERCIAL AND INDUSTRIAL EQUIPMENT
Subpart F—Commercial Air Conditioners and Heat Pumps

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§431.97 Energy efficiency standards and their compliance dates.

(a) All basic models of commercial package air-conditioning and heating equipment must be tested for performance using the applicable DOE test procedure in §431.96, be compliant with the applicable standards set forth in paragraphs (b) through (f) of this section, and be certified to the Department under 10 CFR part 429.

(b) Each commercial air conditioner or heat pump (not including single package vertical air conditioners and single package vertical heat pumps, packaged terminal air conditioners and packaged terminal heat pumps, computer room air conditioners, and variable refrigerant flow systems) manufactured starting on the compliance date listed in the corresponding table must meet the applicable minimum energy efficiency standard level(s) set forth in Tables 1 through 6 of this section.

Table 1 to §431.97—Minimum Cooling Efficiency Standards for Air Conditioning and Heating Equipment

[Not including single package vertical air conditioners and single package vertical heat pumps, packaged terminal air conditioners and packaged terminal heat pumps, computer room air conditioners, variable refrigerant flow multi-split air conditioners and heat pumps, and double-duct air-cooled commercial package air conditioning and heating equipment]

Equipment type	Cooling capacity	Subcategory	Heating type	Efficiency level	Compliance date: Equipment manufactured starting on . . .
Small Commercial Package Air Conditioning and Heating Equipment (Air-Cooled, 3-Phase, Split-System)	<65,000 Btu/h	AC	All	SEER = 13	June 16, 2008.
		HP	All	SEER = 13	June 16, 2008.[1]
Small Commercial Package Air Conditioning and Heating Equipment (Air-Cooled, 3-Phase, Single-Package)	<65,000 Btu/h	AC	All	SEER = 13	June 16, 2008.[1]
		HP	All	SEER =	June 16, 2008.[1]

				13	
Small Commercial Package Air Conditioning and Heating Equipment (Air-Cooled)	≥65,000 Btu/h and <135,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 11.2	January 1, 2010.[2]
			All Other Types of Heating	EER = 11.0	January 1, 2010.[2]
		HP	No Heating or Electric Resistance Heating	EER = 11.0	January 1, 2010.[2]
			All Other Types of Heating	EER = 10.8	January 1, 2010.[2]
Large Commercial Package Air Conditioning and Heating Equipment (Air-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 11.0	January 1, 2010.[2]
			All Other Types of Heating	EER = 10.8	January 1, 2010.[2]
		HP	No Heating or Electric Resistance Heating	EER = 10.6	January 1, 2010.[2]
			All Other Types of Heating	EER = 10.4	January 1, 2010.[2]
Very Large Commercial Package Air Conditioning and Heating Equipment (Air-Cooled)	≥240,000 Btu/h and <760,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 10.0	January 1, 2010.[2]
			All Other Types of Heating	EER = 9.8	January 1, 2010.[2]
		HP	No Heating or Electric Resistance Heating	EER = 9.5	January 1, 2010.[2]
			All Other Types of Heating	EER = 9.3	January 1, 2010.[2]
Small Commercial Package Air Conditioning and Heating Equipment (Water-Cooled)	<65,000 Btu/h	AC	All	EER = 12.1	October 29, 2003.
	≥65,000 Btu/h and <135,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 12.1	June 1, 2013.
			All Other Types of Heating	EER = 11.9	June 1, 2013.
Large Commercial Package Air-Conditioning and Heating Equipment (Water-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 12.5	June 1, 2014.
			All Other Types of Heating	EER = 12.3	June 1, 2014.
Very Large Commercial Package Air-Conditioning and Heating Equipment (Water-	≥240,000 Btu/h and	AC	No Heating or Electric	EER = 12.4	June 1, 2014.

Cooled)	<760,000 Btu/h		Resistance Heating		
			All Other Types of Heating	EER = 12.2	June 1, 2014.
Small Commercial Package Air-Conditioning and Heating Equipment (Evaporatively-Cooled)	<65,000 Btu/h	AC	All	EER = 12.1	October 29, 2003.
	≥65,000 Btu/h and <135,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 12.1	June 1, 2013.
			All Other Types of Heating	EER = 11.9	June 1, 2013.
Large Commercial Package Air-Conditioning and Heating Equipment (Evaporatively-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 12.0	June 1, 2014.
			All Other Types of Heating	EER = 11.8	June 1, 2014.
Very Large Commercial Package Air Conditioning and Heating Equipment (Evaporatively-Cooled)	≥240,000 Btu/h and <760,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 11.9	June 1, 2014.
			All Other Types of Heating	EER = 11.7	June 1, 2014.
Small Commercial Package Air-Conditioning and Heating Equipment (Water-Source: Water-to-Air, Water-Loop)	<17,000 Btu/h	HP	All	EER = 11.2	October 29, 2003.[3]
	≥17,000 Btu/h and <65,000 Btu/h	HP	All	EER = 12.0	October 29, 2003.[3]
	≥65,000 Btu/h and <135,000 Btu/h	HP	All	EER = 12.0	October 29, 2003.[3]

[1]And manufactured before January 1, 2017. See Table 3 of this section for updated efficiency standards.

[2]And manufactured before January 1, 2018. See Table 3 of this section for updated efficiency standards.

[3]And manufactured before October 9, 2015. See Table 3 of this section for updated efficiency standards.

Table 2 to §431.97—Minimum Heating Efficiency Standards for Air Conditioning and Heating Equipment [Heat Pumps]

[Not including single package vertical air conditioners and single package vertical heat pumps, packaged terminal air conditioners and packaged terminal heat pumps, computer room air conditioners, variable refrigerant flow multi-split air conditioners and heat pumps, and double-duct air-cooled commercial package air conditioning and heating equipment]

Equipment type	Cooling capacity	Efficiency level	Compliance date: Equipment manufactured starting on . . .
Small Commercial Package Air Conditioning and Heating Equipment (Air-Cooled, 3-Phase, Split-System)	<65,000 Btu/h	HSPF = 7.7	June 16, 2008.[1]
Small Commercial Pacakage Air-Conditioning and Heating Equipment (Air-Cooled, 3-Phase, Single-Package)	<65,000 Btu/h	HSPF = 7.7	June 16, 2008.[1]
Small Commercial Package Air Conditioning and Heating Equipment (Air-Cooled)	≥65,000 Btu/h and <135,000 Btu/h	COP = 3.3	January 1, 2010.[2]
Large Commercial Packaged Air Conditioning and Heating Equipment (Air-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	COP = 3.2	January 1, 2010.[2]
Very Large Commercial Packaged Air Conditioning and Heating Equipment (Air-Cooled)	≥240,000 Btu/h and <760,000 Btu/h	COP = 3.2	January 1, 2010.[2]
Small Commercial Packaged Air Conditioning and Heating Equipment (Water-Source: Water-to-Air, Water-Loop)	<135,000 Btu/h	COP = 4.2	October 29, 2003.[3]

[1]And manufactured before January 1, 2017. See Table 4 of this section for updated heating efficiency standards.

[2]And manufactured before January 1, 2018. See Table 4 of this section for updated heating efficiency standards.

[3]And manufactured before October 9, 2015. See Table 4 of this section for updated heating efficiency standards.

Table 3 to §431.97—Updates to the Minimum Cooling Efficiency Standards for Air Conditioning and Heating Equipment

[Not including single package vertical air conditioners and single package vertical heat pumps, packaged terminal air conditioners and packaged terminal heat pumps, computer room air conditioners, variable refrigerant flow multi-split air conditioners and heat pumps, and double-duct air-cooled commercial package air conditioning and heating equipment]

Equipment type	Cooling capacity	Subcategory	Heating type	Efficiency level	Compliance date: Equipment manufactured starting on . . .
Small Commercial Packaged Air Conditioning and Heating Equipment (Air-Cooled)	≥65,000 Btu/h and <135,000 Btu/h	AC	Electric Resistance Heating or No Heating	IEER = 12.9 IEER = 14.8	January 1, 2018.[1] January 1, 2023.
			All Other Types of Heating	IEER = 12.7 IEER = 14.6	January 1, 2018.[1] January 1, 2023.
		HP	Electric Resistance Heating or No Heating	IEER = 12.2 IEER = 14.1	January 1, 2018.[1] January 1, 2023.
			All Other Types of	IEER = 12.0	January 1, 2018.[1]

			Heating	IEER = 13.9	January 1, 2023.
Large Commercial Packaged Air Conditioning and Heating Equipment (Air-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	AC	Electric Resistance Heating or No Heating	IEER = 12.4 IEER = 14.2	January 1, 2018.[1] January 1, 2023.
			All Other Types of Heating	IEER = 12.2 IEER = 14.0	January 1, 2018.[1] January 1, 2023.
		HP	Electric Resistance Heating or No Heating	IEER = 11.6 IEER = 13.5	January 1, 2018.[1] January 1, 2023.
			All Other Types of Heating	IEER = 11.4 IEER = 13.3	January 1, 2018.[1] January 1, 2023.
Very Large Commercial Packaged Air Conditioning and Heating Equipment (Air-Cooled)	≥240,000 Btu/h and <760,000 Btu/h	AC	Electric Resistance Heating or No Heating	IEER = 11.6 IEER = 13.2	January 1, 2018.[1] January 1, 2023.
			All Other Types of Heating	IEER = 11.4 IEER = 13.0	January 1, 2018.[1] January 1, 2023.
		HP	Electric Resistance Heating or No Heating	IEER = 10.6 IEER = 12.5	January 1, 2018.[1] January 1, 2023.
			All Other Types of Heating	IEER = 10.4 IEER = 12.3	January 1, 2018.[1] January 1, 2023.
Small Commercial Package Air-Conditioning and Heating Equipment (Air-Cooled, 3-Phase, Split-System)	<65,000 Btu/h	AC	All	SEER = 13.0	June 16, 2008.
		HP	All	SEER = 14.0	January 1, 2017.
Small Commercial Package Air-Conditioning and Heating Equipment (Air-Cooled, 3-Phase, Single-Package)	<65,000Btu/h	AC	All	SEER = 14.0	January 1, 2017.
		HP	All	SEER = 14.0	January 1, 2017.
Small Commercial Packaged Air-Conditioning and Heating Equipment (Water Source: Water-to-Air, Water-Loop)	<17,000 Btu/h	HP	All	EER = 12.2	October 9, 2015.
	≥17,000 Btu/h and <65,000 Btu/h	HP	All	EER = 13.0	October 9, 2015.
	≥65,000 Btu/h and <135,000Btu/h	HP	All	EER = 13.0	October 9, 2015.

[1]And manufactured before January 1, 2023.

Table 4 to §431.97—Updates to the Minimum Heating Efficiency Standards for Air-Cooled Air Conditioning and Heating Equipment [Heat Pumps]

[Not including single package vertical air conditioners and single package vertical heat pumps, packaged terminal air conditioners and packaged terminal heat pumps, computer room air conditioners, variable refrigerant flow multi-split air conditioners and heat pumps, and double-duct air-cooled commercial package air conditioning and heating equipment]

Equipment type	Cooling capacity	Efficiency level.[1]	Compliance date: Equipment manufactured starting on . . .
Small Commercial Package Air Conditioning and Heating Equipment (Air-Cooled, 3-Phase, Split-Sytem)	<65,000 Btu/h	HSPF = 8.2	January 1, 2017.
Small Commercial Package Air Conditioning and Heating Equipment (Air-Cooled, 3-Phase, Single Package)	<65,000 Btu/h	HSPF = 8.0	January 1, 2017.
Small Commercial Package Air Conditioning and Heating Equipment (Water-Source: Water-to-Air, Water-Loop)	<135,000 Btu/h	COP = 4.3	October 9, 2015.
Small Commercial Packaged Air Conditioning and Heating Equipment (Air-Cooled)	≥65,000 Btu/h and <135,000 Btu/h	COP = 3.3 COP = 3.4	January 1, 2018.[2] January 1, 2023.
Large Commercial Packaged Air Conditioning and Heating Equipment (Air-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	COP = 3.2 COP = 3.3	January 1, 2018.[2] January 1, 2023.
Very Large Commercial Packaged Air Conditioning and Heating Equipment (Air-Cooled)	≥240,000 Btu/h and <760,000 Btu/h	COP = 3.2	January 1, 2018.

[1]For units tested using the relevant AHRI Standards, all COP values must be rated at 47 °F outdoor dry-bulb temperature for air-cooled equipment.

[2]And manufactured before January 1, 2023.

Table 5 to §431.97—Minimum Cooling Efficiency Standards for Double-Duct Air-Conditioning and Heating Equipment

Equipment type	Cooling capacity	Subcategory	Heating type	Efficiency level	Compliance date: Equipment manufactured starting on . . .
Small Double-Duct Commercial Packaged Air Conditioning and Heating Equipment (Air-Cooled)	≥65,000 Btu/h and <135,000 Btu/h	AC	Electric Resistance Heating or No Heating	EER = 11.2	January 1, 2010.
			All Other Types of Heating	EER = 11.0	January 1, 2010.
		HP	Electric Resistance Heating or No Heating	EER = 11.0	January 1, 2010.
			All Other Types of Heating	EER = 10.8	January 1, 2010.
Large Commercial Double-Duct Packaged Air Conditioning and Heating Equipment (Air-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	AC	Electric Resistance Heating or No Heating	EER = 11.0	January 1, 2010.

			All Other Types of Heating	EER = 10.8	January 1, 2010.
		HP	Electric Resistance Heating or No Heating	EER = 10.6	January 1, 2010.
			All Other Types of Heating	EER = 10.4	January 1, 2010.
Very Large Double-Duct Commercial Packaged Air Conditioning and Heating Equipment (Air-Cooled)	≥240,000 Btu/h and <300,000 Btu/h	AC	Electric Resistance Heating or No Heating	EER = 10.0	January 1, 2010.
			All Other Types of Heating	EER = 9.8	January 1, 2010.
		HP	Electric Resistance Heating or No Heating	EER = 9.5	January 1, 2010.
			All Other Types of Heating	EER = 9.3	January 1, 2010.

Table 6 to §431.97—Minimum Heating Efficiency Standards for Double-Duct Air-Cooled Air Conditioning and Heating Equipment

[Heat pumps]

Equipment type	Cooling capacity	Heating type	Efficiency level[1]	Compliance date: Equipment manufactured starting on ...
Small Commercial Packaged Air Conditioning and Heating Equipment (Air-Cooled, Double-Duct)	≥65,000 Btu/h and <135,000 Btu/h	Electric Resistance Heating or No Heating	COP = 3.3	January 1, 2010.
		All Other Types of Heating	COP = 3.3	January 1, 2010.
Large Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled, Double-Duct)	≥135,000 Btu/h and <240,000 Btu/h	Electric Resistance Heating or No Heating	COP = 3.2	January 1, 2010.
		All Other Types of Heating	COP = 3.2	January 1, 2010.
Very Large Commercial Packaged Air Conditioning and Heating Equipment (Air-Cooled, Double-Duct)	≥240,000 Btu/h and <300,000 Btu/h	Electric Resistance Heating or No Heating	COP = 3.2	January 1, 2010.
		All Other Types of Heating	COP = 3.2	January 1, 2010.

[1]For units tested using the relevant AHRI Standards, all COP values must be rated at 47 °F outdoor dry-bulb temperature for air-cooled equipment.

(c) Each non-standard size packaged terminal air conditioner (PTAC) and packaged terminal heat pump (PTHP) manufactured on or after October 7, 2010 must meet the applicable minimum energy efficiency standard level(s) set forth in Table 7 of this section. Each standard size PTAC manufactured on or after October 8, 2012, and before January 1, 2017 must meet the applicable minimum energy efficiency standard level(s) set forth in Table 7 of this section. Each standard size PTHP manufactured on or after October 8, 2012 must meet the applicable minimum energy efficiency standard level(s) set forth in Table 7 of this section. Each standard size PTAC manufactured on or after January 1, 2017 must meet the applicable minimum energy efficiency standard level(s) set forth in Table 8 of this section.

Table 7 to §431.97—Minimum Efficiency Standards for PTAC and PTHP

Equipment type	Category	Cooling capacity	Efficiency level	Compliance date: products manufactured on and after . . .
PTAC	Standard Size	<7,000 Btu/h	EER = 11.7	October 8, 2012.[2]
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 13.8−(0.3 × Cap[1])	October 8, 2012.[2]
		>15,000 Btu/h	EER = 9.3	October 8, 2012.[2]
	Non-Standard Size	<7,000 Btu/h	EER = 9.4	October 7, 2010.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 10.9−(0.213 × Cap[1])	October 7, 2010.
		>15,000 Btu/h	EER = 7.7	October 7, 2010.
PTHP	Standard Size	<7,000 Btu/h	EER = 11.9 COP = 3.3	October 8, 2012.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 14.0−(0.3 × Cap[1]) COP = 3.7−(0.052 × Cap[1])	October 8, 2012.
		>15,000 Btu/h	EER = 9.5 COP = 2.9	October 8, 2012.
	Non-Standard Size	<7,000 Btu/h	EER = 9.3 COP = 2.7	October 7, 2010.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 10.8−(0.213 × Cap[1]) COP = 2.9−(0.026 × Cap[1])	October 7, 2010.
		>15,000 Btu/h	EER = 7.6 COP = 2.5	October 7, 2010.

[1]"Cap" means cooling capacity in thousand Btu/h at 95 °F outdoor dry-bulb temperature.

[2]And manufactured before January 1, 2017. See Table 8 of this section for updated efficiency standards that apply to this category of equipment manufactured on and after January 1, 2017.

Table 8 to §431.97—Updated Minimum Efficiency Standards for PTAC

Equipment type	Category	Cooling capacity	Efficiency level	Compliance date: products manufactured on and after . . .

PTAC	Standard Size	<7,000 Btu/h	EER = 11.9	January 1, 2017.
		≥7,000 Btu/h and ≤15,000 Btu/h	EER = 14.0−(0.3 × Cap[1])	January 1, 2017.
		>15,000 Btu/h	EER = 9.5	January 1, 2017.

[1]"Cap" means cooling capacity in thousand Btu/h at 95 °F outdoor dry-bulb temperature.

(d)(1) Each single package vertical air conditioner and single package vertical heat pump manufactured on or after January 1, 2010, but before October 9, 2015 (for models ≥65,000 Btu/h and <135,000 Btu/h) or October 9, 2016 (for models ≥135,000 Btu/h and <240,000 Btu/h), must meet the applicable minimum energy conservation standard level(s) set forth in this section.

Table 9 to §431.97—Minimum Efficiency Standards for Single Package Vertical Air Conditioners and Single Package Vertical Heat Pumps

Equipment type	Cooling capacity	Sub-category	Efficiency level	Compliance date: products manufactured on and after . . .
Single package vertical air conditioners and single package vertical heat pumps, single-phase and three-phase	<65,000 Btu/h	AC HP	EER = 9.0 EER = 9.0 COP = 3.0	January 1, 2010 January 1, 2010
Single package vertical air conditioners and single package vertical heat pumps	≥65,000 Btu/h and <135,000 Btu/h	AC HP	EER = 8.9 EER = 8.9 COP = 3.0	January 1, 2010 January 1, 2010
Single package vertical air conditioners and single package vertical heat pumps	≥135,000 Btu/h and <240,000 Btu/h	AC HP	EER = 8.6 EER = 8.6 COP = 2.9	January 1, 2010 January 1, 2010

(2) Each single package vertical air conditioner and single package vertical heat pump manufactured on and after October 9, 2015 (for models ≥65,000 Btu/h and <135,000 Btu/h) or October 9, 2016 (for models ≥135,000 Btu/h and <240,000 Btu/h), but before September 23, 2019 must meet the applicable minimum energy conservation standard level(s) set forth in this section.

Table 10 to §431.97—Minimum Efficiency Standards for Single Package Vertical Air Conditioners and Single Package Vertical Heat Pumps

Equipment type	Cooling capacity	Sub-category	Efficiency level	Compliance date: Products manufactured on and after . . .
Single package vertical air conditioners and single package vertical heat pumps, single-phase and three-phase	<65,000 Btu/h	AC HP	EER = 9.0 EER = 9.0 COP = 3.0	January 1, 2010 January 1, 2010
Single package vertical air conditioners and single package vertical heat pumps	≥65,000 Btu/h and <135,000 Btu/h	AC HP	EER = 10.0 EER = 10.0 COP = 3.0	October 9, 2015 October 9, 2015
Single package vertical air conditioners and single package vertical heat pumps	≥135,000 Btu/h and <240,000	AC HP	EER = 10.0	October 9, 2016 October 9, 2016

package vertical heat pumps	and <240,000 Btu/h	HP	EER = 10.0 COP = 3.0	October 9, 2016.

(3) Each single package vertical air conditioner and single package vertical heat pump manufactured on and after September 23, 2019 must meet the applicable minimum energy conservation standard level(s) set forth in this section.

Table 11 to §431.97—Updated Minimum Efficiency Standards for Single Package Vertical Air Conditioners and Single Package Vertical Heat Pumps

Equipment type	Cooling capacity	Sub-category	Efficiency level	Compliance date: products manufactured on and after . . .
Single package vertical air conditioners and single package vertical heat pumps, single-phase and three-phase	<65,000 Btu/h	AC HP	EER = 11.0 EER = 11.0 COP = 3.3	September 23, 2019. September 23, 2019.
Single package vertical air conditioners and single package vertical heat pumps	≥65,000 Btu/h and <135,000 Btu/h	AC HP	EER = 10.0 EER = 10.0 COP = 3.0	October 9, 2015. October 9, 2015.
Single package vertical air conditioners and single package vertical heat pumps	≥135,000 Btu/h and <240,000 Btu/h	AC HP	EER = 10.0 EER = 10.0 COP = 3.0	October 9, 2016. October 9, 2016.

(e) Each computer room air conditioner with a net sensible cooling capacity less than 65,000 Btu/h manufactured on or after October 29, 2012, and each computer room air conditioner with a net sensible cooling capacity greater than or equal to 65,000 Btu/h manufactured on or after October 29, 2013, must meet the applicable minimum energy efficiency standard level(s) set forth in this section.

Table 12 to §431.97—Minimum Efficiency Standards for Computer Room Air Conditioners

Equipment type	Net sensible cooling capacity	Minimum SCOP efficiency		Compliance date: Products manufactured on and after . . .
		Downflow unit	Upflow unit	
Computer Room Air Conditioners, Air-Cooled	<65,000 Btu/h ≥65,000 Btu/h and <240,000 Btu/h	2.20 2.10	2.09 1.99	October 29, 2012. October 29, 2013.
	≥240,000 Btu/h and <760,000 Btu/h	1.90	1.79	October 29, 2013.
Computer Room Air Conditioners, Water-Cooled	<65,000 Btu/h ≥65,000 Btu/h and <240,000 Btu/h	2.60 2.50	2.49 2.39	October 29, 2012. October 29, 2013.
	≥240,000 Btu/h and <760,000 Btu/h	2.40	2.29	October 29, 2013.

Computer Room Air Conditioners, Water-Cooled with a Fluid Economizer	<65,000 Btu/h ≥65,000 Btu/h and <240,000 Btu/h ≥240,000 Btu/h and <760,000 Btu/h	2.55 2.45 2.35	2.44 2.34 2.24	October 29, 2012. October 29, 2013. October 29, 2013.
Computer Room Air Conditioners, Glycol-Cooled	<65,000 Btu/h ≥65,000 Btu/h and <240,000 Btu/h	2.50 2.15	2.39 2.04	October 29, 2012. October 29, 2013.
	≥240,000 Btu/h and <760,000 Btu/h	2.10	1.99	October 29, 2013.
Computer Room Air Conditioner, Glycol-Cooled with a Fluid Economizer	<65,000 Btu/h ≥65,000 Btu/h and <240,000 Btu/h ≥240,000 Btu/h and <760,000 Btu/h	2.45 2.10 2.05	2.34 1.99 1.94	October 29, 2012. October 29, 2013. October 29, 2013.

(f) Each variable refrigerant flow air conditioner or heat pump manufactured on or after the compliance date listed in this table must meet the applicable minimum energy efficiency standard level(s) set forth in this section.

Table 13 to §431.97—Minimum Efficiency Standards for Variable Refrigerant Flow Multi-Split Air Conditioners and Heat Pumps

Equipment type	Cooling capacity	Heating type[1]	Efficiency level	Compliance date: Products manufactured on and after . . .
VRF Multi-Split Air Conditioners (Air-Cooled)	<65,000 Btu/h ≥65,000 Btu/h and <135,000 Btu/h	All No Heating or Electric Resistance Heating	13.0 SEER 11.2 EER	June 16, 2008. January 1, 2010.
		All Other Types of Heating	11.0 EER	January 1, 2010.
	≥135,000 Btu/h and <240,000 Btu/h	No Heating or Electric Resistance Heating	11.0 EER	January 1, 2010.
		All Other Types of Heating	10.8 EER	January 1, 2010.
	≥240,000 Btu/h and <760,000 Btu/h	No Heating or Electric Resistance Heating	10.0 EER	January 1, 2010.
		All Other Types of Heating	9.8 EER	January 1, 2010.
VRF Multi-Split Heat Pumps (Air-Cooled)	<65,000 Btu/h	All	13.0 SEER 7.7 HSPF	June 16, 2008.
	≥65,000 Btu/h and <135,000 Btu/h	No Heating or Electric Resistance Heating	11.0 EER 3.3 COP	January 1, 2010.
		All Other Types of Heating	10.8 EER 3.3 COP	January 1, 2010.
	≥135,000 Btu/h and <240,000 Btu/h	No Heating or Electric Resistance Heating	10.6 EER 3.2 COP	January 1, 2010.
		All Other Types of Heating	10.4 EER 3.2 COP	January 1, 2010.
	≥240,000 Btu/h and <760,000 Btu/h	No Heating or Electric Resistance Heating	9.5 EER 3.2 COP	January 1, 2010.
		All Other Types of Heating	9.3 EER 3.2 COP	January 1, 2010.
VRF Multi-Split Heat Pumps (Water-Source)* * *	<17,000 Btu/h	Without heat recovery	12.0 EER 4.2 COP	October 29, 2012. October 29, 2003.
		With heat recovery	11.8 EER 4.2 COP	October 29, 2012. October 29, 2003.

			[illegible]	[illegible]
	≥17,000 Btu/h and <65,000 Btu/h	All	12.0 EER 4.2 COP	October 29, 2003.
	≥65,000 Btu/h and <135,000 Btu/h	All	12.0 EER 4.2 COP	October 29, 2003.
	≥135,000 Btu/h and <760,000 Btu/h	Without heat recovery	10.0 EER 3.9 COP	October 29, 2013.
		With heat recovery	9.8 EER 3.9 COP	October 29, 2013

[1]VRF Multi-Split Heat Pumps (Air-Cooled) with heat recovery fall under the category of "All Other Types of Heating" unless they also have electric resistance heating, in which case it falls under the category for "No Heating or Electric Resistance Heating."

[77 FR 28991, May 16, 2012, as amended at 77 FR 76830, Dec. 31, 2012; 80 FR 42664, July 17, 2015; 80 FR 43212, July 21, 2015; 80 FR 56895, Sept. 21, 2015; 80 FR 57500, Sept. 23, 2015; 81 FR 2529, Jan. 15, 2016; 81 FR 53907, Aug. 15, 2016]

ELECTRONIC CODE OF FEDERAL REGULATIONS

e-CFR data is current as of August 5, 2020

Title 10: Energy
PART 431—ENERGY EFFICIENCY PROGRAM FOR CERTAIN COMMERCIAL AND INDUSTRIAL EQUIPMENT
Subpart Y—Pumps

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§431.465 Pumps energy conservation standards and their compliance dates.

(a) For the purposes of paragraph (b) of this section, "PEI_{CL}" means the constant load pump energy index and "PEI_{VL}" means the variable load pump energy index, both as determined in accordance with the test procedure in §431.464. For the purposes of paragraph (c) of this section, "BEP" means the best efficiency point as determined in accordance with the test procedure in §431.464.

(b) Each pump that is manufactured starting on January 27, 2020 and that:

(1) Is in one of the equipment classes listed in the table in paragraph (b)(4) of this section;

(2) Meets the definition of a clean water pump in §431.462;

(3) Is not listed in paragraph (c) of this section; and

(4) Conforms to the characteristics listed in paragraph (d) of this section must have a PEI_{CL} or PEI_{VL} rating of not more than 1.00 using the appropriate C-value in the table in this paragraph (b)(4):

Equipment class[1]	Maximum PEI[2]	C-value[3]
ESCC.1800.CL	1.00	128.47
ESCC.3600.CL	1.00	130.42
ESCC.1800.VL	1.00	128.47
ESCC.3600.VL	1.00	130.42
ESFM.1800.CL	1.00	128.85
ESFM.3600.CL	1.00	130.99
ESFM.1800.VL	1.00	128.85
ESFM.3600.VL	1.00	130.99
IL.1800.CL	1.00	129.30
IL.3600.CL	1.00	133.84
IL.1800.VL	1.00	129.30
IL.3600.VL	1.00	133.84
RSV.1800.CL	1.00	129.63

RSV.3600.CL	1.00	133.20
RSV.1800.VL	1.00	129.63
RSV.3600.VL	1.00	133.20
ST.1800.CL	1.00	138.78
ST.3600.CL	1.00	134.85
ST.1800.VL	1.00	138.78
ST.3600.VL	1.00	134.85

[1]Equipment class designations consist of a combination (in sequential order separated by periods) of: (1) An equipment family (ESCC = end suction close-coupled, ESFM = end suction frame mounted/own bearing, IL = in-line, RSV = radially split, multi-stage, vertical, in-line diffuser casing, ST = submersible turbine; all as defined in §431.462); (2) nominal speed of rotation (1800 = 1800 rpm, 3600 = 3600 rpm); and (3) an operating mode (CL = constant load, VL = variable load). Determination of the operating mode is determined using the test procedure in appendix A to this subpart.

[2]For equipment classes ending in .CL, the relevant PEI is PEI_{CL}. For equipment classes ending in .VL, the relevant PEI is PEI_{VL}.

[3]The C-values shown in this table must be used in the equation for PER_{STD} when calculating PEI_{CL} or PEI_{VL}, as described in section II.B of appendix A to this subpart.

(c) The energy efficiency standards in paragraph (b) of this section do not apply to the following pumps:

(1) Fire pumps;

(2) Self-priming pumps;

(3) Prime-assist pumps;

(4) Magnet driven pumps;

(5) Pumps designed to be used in a nuclear facility subject to 10 CFR part 50, “Domestic Licensing of Production and Utilization Facilities”;

(6) Pumps meeting the design and construction requirements set forth in Military Specification MIL-P-17639F, “Pumps, Centrifugal, Miscellaneous Service, Naval Shipboard Use” (as amended); MIL-P-17881D, “Pumps, Centrifugal, Boiler Feed, (Multi-Stage)” (as amended); MIL-P-17840C, “Pumps, Centrifugal, Close-Coupled, Navy Standard (For Surface Ship Application)” (as amended); MIL-P-18682D, “Pump, Centrifugal, Main Condenser Circulating, Naval Shipboard” (as amended); MIL-P-18472G, “Pumps, Centrifugal, Condensate, Feed Booster, Waste Heat Boiler, And Distilling Plant” (as amended). Military specifications and standards are available for review at *http://everyspec.com/MIL-SPECS*.

(d) The energy conservation standards in paragraph (b) of this section apply only to pumps that have the following characteristics:

(1) Flow rate of 25 gpm or greater at BEP at full impeller diameter;

(2) Maximum head of 459 feet at BEP at full impeller diameter and the number of stages required for testing;

(3) Design temperature range from 14 to 248 °F;

(4) Designed to operate with either:

(i) A 2- or 4-pole induction motor; or

(ii) A non-induction motor with a speed of rotation operating range that includes speeds of rotation between 2,880 and 4,320 revolutions per minute and/or 1,440 and 2,160 revolutions per minute; and

(iii) In either case, the driver and impeller must rotate at the same speed;

(5) For ST pumps, a 6-inch or smaller bowl diameter; and

(6) For ESCC and ESFM pumps, specific speed less than or equal to 5,000 when calculated using U.S. customary units.

(e) For the purposes of paragraph (f) of this section, “WEF” means the weighted energy factor and “hhp” means the rated hydraulic horsepower, as determined in accordance with the test procedure in §431.464(b) and applicable sampling plans in §429.59 of this chapter.

(f) Each dedicated-purpose pool pump that is not a submersible pump and is manufactured starting on July 19, 2021 must have a WEF rating that is not less than the value calculated from the following table:

Equipment class		**Minimum allowable WEF score [kgal/kWh]**	**Minimum allowable WEF score [kgal/kWh]**
Dedicated-purpose pool pump variety	**hhp Applicability**	**Motor phase**	
Self-priming pool filter pumps	0.711 hp ≤hhp <2.5 hp	Single	WEF = −2.30 * ln (hhp) + 6.59.
Self-priming pool filter pumps	hhp <0.711 hp	Single	WEF = 5.55, for hhp ≤0.13 hp −1.30 * ln (hhp) + 2.90, for hhp >0.13 hp.
Non-self-priming pool filter pumps	hhp <2.5 hp	Any	WEF = 4.60, for hhp ≤0.13 hp −0.85 * ln (hhp) + 2.87, for hhp >0.13 hp.
Pressure cleaner booster pumps	Any	Any	WEF = 0.42.

(g) Each integral cartridge filter pool pump and integral sand filter pool pump that is manufactured starting on July 19, 2021 must be distributed in commerce with a pool pump timer that is either integral to the pump or a separate component that is shipped with the pump.

(h) For all dedicated-purpose pool pumps distributed in commerce with freeze protection controls, the pump must be shipped with freeze protection disabled or with the following default, user-adjustable settings:

(1) The default dry-bulb air temperature setting is no greater than 40 °F;

(2) The default run time setting shall be no greater than 1 hour (before the temperature is rechecked); and

(3) The default motor speed shall not be more than ½ of the maximum available speed.

[81 FR 4431, Jan. 26, 2016, as amended at 82 FR 5742, Jan. 18, 2017]