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§ 431.64 Uniform test method for the measurement of energy consumption of commercial refrigerators, freezers, and refrigerator-freezers.

(a) *Scope.* This section provides the test procedures for measuring, pursuant to EPCA, the daily energy consumption in kilowatt hours per day (kWh/day) for a given product category and volume or total display area of commercial refrigerators, freezers, and refrigerator-freezers.

(b) *Testing and calculations.* Determine the daily energy consumption of each covered commercial refrigerator, freezer, or refrigerator-freezer by conducting the appropriate test procedure set forth below, in appendix A or B to this subpart. The daily energy consumption of commercial refrigeration equipment shall be calculated using raw measured values and the final test results shall be reported in increments of 0.01 kWh/day.

[70 FR 60414, Oct. 18, 2005, as amended at 77 FR 10318, Feb. 21, 2012; 79 FR 22308, Apr. 21, 2014]

ENERGY CONSERVATION STANDARDS

§ 431.66 Energy conservation standards and their effective dates.

(a) In this section—

(1) The term “AV” means the adjusted volume (ft³) (defined as 1.63 × frozen temperature compartment volume (ft³) + chilled temperature compartment volume (ft³)) with compartment volumes measured in accordance with the Association of Home Appliance Manufacturers Standard HRF1–1979.

(2) The term “V” means the chilled or frozen compartment volume (ft³) (as defined in the Association of Home Appliance Manufacturers Standard HRF1–1979).

(3) For the purpose of paragraph (d) of this section, the term “TDA” means the total display area (ft²) of the case, as defined in ARI Standard 1200–2006, appendix D (incorporated by reference, see § 431.63). For the purpose of paragraph (e) of this section, the term “TDA” means the total display area (ft²) of the case, as defined in AHRI Standard 1200 (I–P)–2010, appendix D (incorporated by reference, see § 431.63).

(b)(1) Each commercial refrigerator, freezer, and refrigerator-freezer with a self-contained condensing unit designed for holding temperature applications manufactured on or after January 1, 2010 and before March 27, 2017 shall have a daily energy consumption (in kilowatt-hours per day) that does not exceed the following:

Category	Maximum daily energy consumption (kilowatt hours per day)
Refrigerators with solid doors	0.10V + 2.04.
Refrigerators with transparent doors.	0.12V + 3.34.
Freezers with solid doors	0.40V + 1.38.
Freezers with transparent doors.	0.75V + 4.10.
Refrigerator/freezers with solid doors.	the greater of 0.27AV–0.71 or 0.70.

(2) Each service over the counter, self-contained, medium temperature commercial refrigerator (SOC–SC–M) manufactured on or after January 1, 2012, shall have a total daily energy consumption (in kilowatt hours per day) of not more than 0.6 × TDA + 1.0. As used in the preceding sentence, “TDA” means the total display area (ft²) of the case, as defined in the AHRI Standard 1200 (I–P)–2010, appendix D (incorporated by reference, see § 431.63).

(c) Each commercial refrigerator with a self-contained condensing unit designed for pull-down temperature applications and transparent doors manufactured on or after January 1, 2010 and before March 27, 2017 shall have a daily energy consumption (in kilowatt-hours per day) of not more than 0.126V + 3.51.

(d) Each commercial refrigerator, freezer, and refrigerator-freezer with a self-contained condensing unit and without doors; commercial refrigerator, freezer, and refrigerator-freezer with a remote condensing unit; and commercial ice-cream freezer manufactured on or after January 1, 2012 and before March 27, 2017 shall have a daily energy consumption (in kilowatt-hours per day) that does not exceed the levels specified:

(1) For equipment other than hybrid equipment, refrigerator-freezers or wedge cases:

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Equipment category	Condensing unit configuration	Equipment family	Rating temp. (°F)	Operating temp. (°F)	Equipment class designation *	Maximum daily energy consumption (kWh/day)		
Remote Condensing Commercial Refrigerators and Commercial Freezers.	Remote (RC)	Vertical Open (VOP).	38 (M) 0 (L)	≥32±2 <32±2	VOP.RC.M .. VOP.RC.L ...	0.82 × TDA + 4.07 2.27 × TDA + 6.85		
		Semivertical Open (SVO).	38 (M) 0 (L)	≥32±2 <32±2	SVO.RC.M .. SVO.RC.L ...	0.83 × TDA + 3.18 2.27 × TDA + 6.85		
		Horizontal Open (HZO).	38 (M) 0 (L)	≥32±2 <32±2	HZO.RC.M .. HZO.RC.L ...	0.35 × TDA + 2.88 0.57 × TDA + 6.88		
		Vertical Closed Transparent (VCT).	38 (M) 0 (L)	≥32±2 <32±2	VCT.RC.M .. VCT.RC.L ...	0.22 × TDA + 1.95 0.56 × TDA + 2.61		
		Horizontal Closed Transparent (HCT).	38 (M) 0 (L)	≥32±2 <32±2	HCT.RC.M .. HCT.RC.L ...	0.16 × TDA + 0.13 0.34 × TDA + 0.26		
		Vertical Closed Solid (VCS).	38 (M) 0 (L)	≥32±2 <32±2	VCS.RC.M .. VCS.RC.L ...	0.11 × V + 0.26 0.23 × V + 0.54		
		Horizontal Closed Solid (HCS).	38 (M) 0 (L)	≥32±2 <32±2	HCS.RC.M .. HCS.RC.L ...	0.11 × V + 0.26 0.23 × V + 0.54		
		Service Over Counter (SOC).	38 (M) 0 (L)	≥32±2 <32±2	SOC.RC.M .. SOC.RC.L ...	0.51 × TDA + 0.11 1.08 × TDA + 0.22		
		Self-Contained Commercial Refrigerators and Commercial Freezers without Doors.	Self-Contained (SC).	Vertical Open (VOP).	38 (M) 0 (L)	≥32±2 <32±2	VOP.SC.M .. VOP.SC.L ...	1.74 × TDA + 4.71 4.37 × TDA + 11.82
				Semivertical Open (SVO).	38 (M) 0 (L)	≥32±2 <32±2	SVO.SC.M .. SVO.SC.L ...	1.73 × TDA + 4.59 4.34 × TDA + 11.51
				Horizontal Open ...	38 (M) 0 (L)	≥32±2 <32±2	HZO.SC.M .. HZO.SC.L ...	0.77 × TDA + 5.55 1.92 × TDA + 7.08
				Vertical Closed Transparent (VCT).			VCT.SC.L ...	1.92 × TDA + 7.08
				Horizontal Closed Transparent (HCT).			HCT.SC.L ...	2.89 × TDA + 8.7
				Vertical Closed Solid (VCS).			VCS.SC.L ...	2.89 × TDA + 8.7
Commercial Ice-Cream Freezers.	Remote (RC)	Vertical Open (VOP).	-15 (I)	≤ -5±2***	VOP.RC.I	2.89 × TDA + 8.7		
		Semivertical Open (SVO).			SVO.RC.I	2.89 × TDA + 8.7		
		Horizontal Open (HZO).			HZO.RC.I	0.72 × TDA + 8.74		
		Vertical Closed Transparent (VCT).			VCT.RC.I	0.66 × TDA + 3.05		
		Horizontal Closed Transparent (HCT).			HCT.RC.I	0.4 × TDA + 0.31		
		Vertical Closed Solid (VCS).			VCS.RC.I	0.27 × V + 0.63		
		Horizontal Closed Solid (HCS).			HCS.RC.I	0.27 × V + 0.63		
		Service Over Counter (SVO).			SOC.RC.I	1.26 × TDA + 0.26		
	Self-Contained (SC).	Vertical Open (VOP).			VOP.SC.I	5.55 × TDA + 15.02		
		Semivertical Open (SVO).			SVO.SC.I	5.52 × TDA + 14.63		
		Horizontal Open (HZO).			HZO.SC.I	2.44 × TDA + 9		
		Vertical Closed Transparent (VCT).			VCT.SC.I	0.67 × TDA + 3.29		
		Horizontal Closed Transparent (HCT).			HCT.SC.I	0.56 × TDA + 0.43		
		Vertical Closed Solid (VCS).			VCS.SC.I	0.38 × V + 0.88		
		Horizontal Closed Solid (HCS).			HCS.SC.I	0.38 × V + 0.88		
		Service Over Counter (SVO).			SOC.SC.I	1.76 × TDA + 0.36		

* The meaning of the letters in this column is indicated in the three columns to the left.

** Ice-cream freezer is defined in 10 CFR 431.62 as a commercial freezer that is designed to operate at or below -5 °F (-21 °C) and that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of ice cream.

(2) For commercial refrigeration equipment with two or more compartments (*i.e.*, hybrid refrigerators, hybrid freezers, hybrid refrigerator-freezers, and non-hybrid refrigerator-freezers), the maximum daily energy consumption (MDEC) for each model shall be the sum of the MDEC values for all of its compartments. For each compartment, measure the TDA or volume of that compartment, and determine the appropriate equipment class based on that compartment's equipment family, condensing unit configuration, and designed operating temperature. The MDEC limit for each compartment shall be the calculated value obtained by entering that compartment's TDA or volume into the standard equation in paragraph (d)(1) of this section for that compartment's equipment class. Measure the calculated daily energy consumption (CDEC) or total daily energy consumption (TDEC) for the entire case:

(i) For remote condensing commercial hybrid refrigerators, hybrid freezers, hybrid refrigerator-freezers, and non-hybrid refrigerator-freezers, where two or more independent condensing units each separately cool only one compartment, measure the total refrigeration load of each compartment separately according to the ARI Standard 1200–2006 test procedure (incorporated by reference, see §431.63). Calculate compressor energy consumption (CEC) for each compartment using Table 1 in ARI Standard 1200–2006 using the saturated evaporator temperature for that compartment. The CDEC for the entire case shall be the sum of the CEC for each compartment, fan energy consumption (FEC), lighting energy consumption (LEC), anti-condensate energy consumption (AEC), defrost energy consumption (DEC), and condensate evaporator pan energy consumption (PEC) (as measured in ARI Standard 1200–2006).

(ii) For remote condensing commercial hybrid refrigerators, hybrid freezers, hybrid refrigerator-freezers, and non-hybrid refrigerator-freezers, where two or more compartments are cooled collectively by one condensing unit, measure the total refrigeration load of the entire case according to the ARI Standard 1200–2006 test procedure (in-

corporated by reference, see §431.63). Calculate a weighted saturated evaporator temperature for the entire case by:

(A) Multiplying the saturated evaporator temperature of each compartment by the volume of that compartment (as measured in ARI Standard 1200–2006),

(B) Summing the resulting values for all compartments, and

(C) Dividing the resulting total by the total volume of all compartments.

Calculate the CEC for the entire case using Table 1 in ARI Standard 1200–2006 (incorporated by reference, see §431.63), using the total refrigeration load and the weighted average saturated evaporator temperature. The CDEC for the entire case shall be the sum of the CEC, FEC, LEC, AEC, DEC, and PEC.

(iii) For self-contained commercial hybrid refrigerators, hybrid freezers, hybrid refrigerator-freezers, and non-hybrid refrigerator-freezers, measure the TDEC for the entire case according to the ARI Standard 1200–2006 test procedure (incorporated by reference, see §431.63).

(3) For remote-condensing and self-contained wedge cases, measure the CDEC or TDEC according to the ARI Standard 1200–2006 test procedure (incorporated by reference, see §431.63). The MDEC for each model shall be the amount derived by incorporating into the standards equation in paragraph (d)(1) of this section for the appropriate equipment class a value for the TDA that is the product of:

(i) The vertical height of the air-curtain (or glass in a transparent door) and (ii) The largest overall width of the case, when viewed from the front.

(e) Each commercial refrigerator, freezer, and refrigerator-freezer with a self-contained condensing unit designed for holding temperature applications and with solid or transparent doors; commercial refrigerator with a self-contained condensing unit designed for pull-down temperature applications and with transparent doors; commercial refrigerator, freezer, and refrigerator-freezer with a self-contained condensing unit and without doors; commercial refrigerator, freezer, and refrigerator-freezer with a remote condensing unit; and commercial ice-

Equipment category	Condensing unit configuration	Equipment family	Rating temp. deg:F	Operating temp. deg:F	Equipment class designation *	Maximum daily energy consumption kWh/day	
Commercial Ice-Cream Freezers.	Remote (RC)	Vertical Open (VOP).	− 15 (I)	≤ − 5**	VOP.RC.I	$2.79 \times TDA + 8.7.$	
		Semivertical Open (SVO).			SVO.RC.I	$2.79 \times TDA + 8.7.$	
		Horizontal Open (HZO).			HZO.RC.I	$0.7 \times TDA + 8.74.$	
		Vertical Closed Transparent (VCT).			VCT.RC.I	$0.58 \times TDA + 3.05.$	
		Horizontal Closed Transparent (HCT).			HCT.RC.I	$0.4 \times TDA + 0.31.$	
		Vertical Closed Solid (VCS).			VCS.RC.I	$0.25 \times V + 0.63.$	
		Horizontal Closed Solid (HCS).			HCS.RC.I	$0.25 \times V + 0.63.$	
		Service Over Counter (SOC).			SOC.RC.I	$1.09 \times TDA + 0.26.$	
		Self-Contained (SC).			Vertical Open (VOP).	VOP.SC.I	$5.4 \times TDA + 15.02.$
					Semivertical Open (SVO).	SVO.SC.I	$5.41 \times TDA + 14.63.$
	Horizontal Open (HZO).		HZO.SC.I	$2.42 \times TDA + 9.$			
	Vertical Closed Transparent (VCT).		VCT.SC.I	$0.62 \times TDA + 3.29.$			
	Horizontal Closed Transparent (HCT).		HCT.SC.I	$0.56 \times TDA + 0.43.$			
	Vertical Closed Solid (VCS).		VCS.SC.I	$0.34 \times V + 0.88.$			
	Horizontal Closed Solid (HCS).		HCS.SC.I	$0.34 \times V + 0.88.$			
	Service Over Counter (SOC).		SOC.SC.I	$1.53 \times TDA + 0.36.$			

*The meaning of the letters in this column is indicated in the columns to the left.
 **Ice-cream freezer is defined in 10 CFR 431.62 as a commercial freezer that is designed to operate at or below −5 °F (−21 °C) and that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of ice cream.

(2) For commercial refrigeration equipment with two or more compartments (i.e., hybrid refrigerators, hybrid freezers, hybrid refrigerator-freezers, and non-hybrid refrigerator-freezers), the maximum daily energy consumption for each model shall be the sum of the MDEC values for all of its compartments. For each compartment, measure the TDA or volume of that compartment, and determine the appropriate equipment class based on that compartment's equipment family, condensing unit configuration, and designed operating temperature. The MDEC limit for each compartment shall be the calculated value obtained by entering that compartment's TDA or volume into the standard equation in paragraph (e)(1) of this section for that compartment's equipment class. Measure the CDEC or TDEC for the entire case as described in § 431.66(d)(2)(i)

through (iii), except that where measurements and calculations reference ARI Standard 1200–2006 (incorporated by reference, see § 431.63), AHRI Standard 1200 (I–P)–2010 (incorporated by reference, see § 431.63) shall be used.

(3) For remote condensing and self-contained wedge cases, measure the CDEC or TDEC according to the AHRI Standard 1200 (I–P)–2010 test procedure (incorporated by reference, see § 431.63). For wedge cases in equipment classes for which a volume metric is used, the MDEC shall be the amount derived from the appropriate standards equation in paragraph (e)(1) of this section. For wedge cases of equipment classes for which a TDA metric is used, the MDEC for each model shall be the amount derived by incorporating into the standards equation in paragraph (e)(1) of this section for the equipment

class a value for the TDA that is the product of:

(i) The vertical height of the air curtain (or glass in a transparent door) and

(ii) The largest overall width of the case, when viewed from the front.

(f) *Exclusions.* The energy conservation standards in paragraphs (b) through (e) of this section do not apply to salad bars, buffet tables, and chef bases or griddle stands.

[70 FR 60414, Oct. 18, 2005, as amended at 74 FR 1140, Jan. 9, 2009; 78 FR 62993, Oct. 23, 2013; 79 FR 22308, Apr. 21, 2014; 79 FR 17816, Mar. 28, 2014]

APPENDIX A TO SUBPART C OF PART 431—UNIFORM TEST METHOD FOR THE MEASUREMENT OF ENERGY CONSUMPTION OF COMMERCIAL REFRIGERATORS, FREEZERS, AND REFRIGERATOR-FREEZERS

NOTE: After October 20, 2014 but before March 28, 2017, any representations made with respect to the energy use or efficiency of commercial refrigeration equipment must be made in accordance with the results of testing pursuant to this appendix.

Manufacturers conducting tests of commercial refrigeration equipment after May 21, 2014 and prior to October 20, 2014, must conduct such test in accordance with either this appendix or §431.64 as it appeared at 10 CFR part 430, subpart B, in the 10 CFR parts 200 to 499 edition revised as of January 1, 2014. Any representations made with respect to the energy use or efficiency of such commercial refrigeration equipment must be in accordance with whichever version is selected. Given that after October 20, 2014 representations with respect to the energy use or efficiency of commercial refrigeration equipment must be made in accordance with tests conducted pursuant to this appendix, manufacturers may wish to begin using this test procedure as soon as possible.

1. Test Procedure

1.1. Determination of Daily Energy Consumption. Determine the daily energy consumption of each covered commercial refrigerator, freezer, refrigerator-freezer or ice-cream freezer by conducting the test procedure set forth in the Air-Conditioning and Refrigeration Institute (ARI) Standard 1200-2006, "Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets," section 3, "Definitions," section 4, "Test Requirements," and section 7, "Symbols and Subscripts" (incorporated by reference, see §431.63). For each commercial refrigerator, freezer, or refrigerator-

freezer with a self-contained condensing unit, also use ARI Standard 1200-2006, section 6, "Rating Requirements for Self-contained Commercial Refrigerated Display Merchandisers and Storage Cabinets." For each commercial refrigerator, freezer, or refrigerator-freezer with a remote condensing unit, also use ARI Standard 1200-2006, section 5, "Rating Requirements for Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets."

1.2. Methodology for Determining Applicability of Transparent Door Equipment Families. To determine if a door for a given model of commercial refrigeration equipment is transparent: (1) Calculate the outer door surface area including frames and mullions; (2) calculate the transparent surface area within the outer door surface area excluding frames and mullions; (3) calculate the ratio of (2) to (1) for each of the outer doors; and (4) the ratio for the transparent surface area of all outer doors must be greater than 0.25 to qualify as a transparent equipment family.

1.3. Additional Specifications for Testing of Components and Accessories. Subject to the provisions regarding specific components and accessories listed below, all standard components that would be used during normal operation of the basic model in the field shall be installed and in operation during testing as recommended by the manufacturer and representative of their typical operation in the field unless such installation and operation is inconsistent with any requirement of the test procedure. The specific components and accessories listed in the subsequent sections shall be operated as stated during the test.

1.3.1. Energy Management Systems. Applicable energy management systems may be activated during the test procedure provided they are permanently installed on the case, configured as sold and in such a manner so as to operate automatically without the intervention of the operator, and do not conflict with any of other requirements for a valid test as specified in this appendix.

1.3.2. Lighting. Energize all lighting, except customer display signs/lights as described in section 1.3.3 and UV lighting as described in section 1.3.6 of this appendix, to the maximum illumination level for the duration of testing. However, if a closed solid unit of commercial refrigeration equipment includes an automatic lighting control system that can turn off internal case lighting when the door is closed, and the manufacturer recommends the use of this system in writing in the product literature delivered with the unit, then the lighting control should be operated in the automatic setting, even if the model has a manual switch that disables the automatic lighting control.

1.3.3. Customer display signs/lights. Do not energize supplemental lighting that exists