



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

**Public Review Draft**

# **Proposed Addendum br to Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings**

**First Public Review (November 2018)  
(Draft Shows Proposed Changes to Current Standard)**

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**(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)**

## **FOREWORD**

*New DOE refrigeration minimum efficiency requirements went into effect on March 27, 2017 and this addendum updates the requirements in table 6.8.1-12 and 6.8.1-13 to align with the DOE requirements. There were also some nomenclature and other changes which have also been updated in this addendum.*

*The DOE approach is to combine the requirements of table 6.8.1-12 commercial refrigerators and 6.8.1-13 into one combined table and we have followed this approach and integrated all the refrigeration requirements into table 6.8.1-13 and will eliminate table 6.8.1-12.*

*The economic justification for the more stringent efficiency levels was addressed in the DOE rulemaking documents for the applicable energy conservation standards rulemaking*

***[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~striketrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]***

## Addendum br to 90.1-2016

Delete 6.4.1.1 because table 6.8.1-12 will be merged into renumbered table 6.8.1-13 which will become table 6.8.1-17 and revised m as shown.

l—Table 6.8.1-12, “Commercial Refrigerators and Freezers—Minimum Efficiency Requirements”

m—Table 6.8.1-13/6.8.1-17, “Commercial Refrigerators, Commercial Freezers, and Refrigeration—Minimum Efficiency Requirements”

Delete the current IP table 6.8.1-12. Note it will not be replaced and will be integrated into table 6.8.1-13

**Table 6.8.1-12 Commercial Refrigerator and Freezers—Minimum Efficiency Requirements**

Equipment Type	Application	Energy Use Limits, kWh/day	Test Procedure
Refrigerator with solid doors	Holding temperature	$0.10 \times V + 2.04$	AHRI 1200
Refrigerator with transparent doors	Holding temperature	$0.12 \times V + 3.34$	AHRI 1200
Freezers with solid doors	Holding temperature	$0.40 \times V + 1.38$	AHRI 1200
Freezers with transparent doors	Holding temperature	$0.75 \times V + 4.10$	AHRI 1200
Refrigerators/freezers with solid doors	Holding temperature	the greater of $0.12 \times V + 3.34$ or 0.70	AHRI 1200
Commercial refrigerators	Pulldown	$0.126 \times V + 3.51$	AHRI 1200

V = the chiller or frozen compartment volume (ft<sup>3</sup>) as defined in Association of Home Appliance Manufacturers Standard HRF-1.

Delete the current IP table 6.8.1-13 and replace it with a new revised table combining table 6.8.1-12 and 6.8.1-13.;

**Table 6.8.1-13 Commercial Refrigeration—Minimum Efficiency Requirements**

Equipment Type		Operating Mode	Rating Temperature	Energy Use Limits <sup>b,c</sup> , kWh/day	Test Procedure
Equipment Class <sup>a</sup>	Family Code				
VOP.RC.M	Vertical open	Remote condensing	Medium temperature	$0.82 \times TDA + 4.07$	AHRI 1200
SVO.RC.M	Semivertical open	Remote condensing	Medium temperature	$0.83 \times TDA + 3.18$	AHRI 1200
HZO.RC.M	Horizontal open	Remote condensing	Medium temperature	$0.35 \times TDA + 2.88$	AHRI 1200
VOP.RC.L	Vertical open	Remote condensing	Low temperature	$2.27 \times TDA + 6.85$	AHRI 1200
HZO.RC.L	Horizontal open	Remote condensing	Low temperature	$0.57 \times TDA + 6.88$	AHRI 1200
VCT.RC.M	Vertical transparent door	Remote condensing	Medium temperature	$0.22 \times TDA + 1.95$	AHRI 1200
VCT.RC.L	Vertical transparent door	Remote condensing	Low temperature	$0.56 \times TDA + 2.61$	AHRI 1200
SOC.RC.M	Service over counter	Remote condensing	Medium temperature	$0.51 \times TDA + 0.11$	AHRI 1200
VOP.SC.M	Vertical open	Self-contained	Medium temperature	$1.74 \times TDA + 4.71$	AHRI 1200
SVO.SC.M	Semivertical open	Self-contained	Medium temperature	$1.73 \times TDA + 4.59$	AHRI 1200
HZO.SC.M	Horizontal open	Self-contained	Medium temperature	$0.77 \times TDA + 5.55$	AHRI 1200
HZO.SC.L	Horizontal open	Self-contained	Low temperature	$1.92 \times TDA + 7.08$ $1.9 \times TDA + 7.08$	AHRI 1200
VCT.SC.I	Vertical transparent door	Self-contained	Ice cream	$0.67 \times TDA + 3.29$	AHRI 1200

VCS.SC.I	Vertical solid door	Self-contained	Ice cream	$0.38 \times V + 0.88$	AHRI 1200
HCT.SC.I	Horizontal transparent door	Self-contained	Ice cream	$0.56 \times TDA + 0.43$	AHRI 1200
SVO.RC.L	Semivertical open	Remote-condensing	Low temperature	$2.27 \times TDA + 6.85$ $2.2 \times TDA + 6.85$	AHRI 1200
VOP.RC.I	Vertical open	Remote-condensing	Ice cream	$2.89 \times TDA + 8.7$	AHRI 1200
SVO.RC.I	Semivertical open	Remote-condensing	Ice cream	$2.89 \times TDA + 8.7$	AHRI 1200
HZO.RC.I	Horizontal open	Remote-condensing	Ice cream	$0.72 \times TDA + 8.74$	AHRI 1200
VCT.RC.I	Vertical transparent door	Remote-condensing	Ice cream	$0.66 \times TDA + 3.05$	AHRI 1200
HCT.RC.M	Horizontal transparent door	Remote-condensing	Medium temperature	$0.16 \times TDA + 0.13$	AHRI 1200
HCT.RC.L	Horizontal transparent door	Remote-condensing	Low temperature	$0.34 \times TDA + 0.26$	AHRI 1200
HCT.RC.I	Horizontal transparent door	Remote-condensing	Ice cream	$0.4 \times TDA + 0.31$	AHRI 1200
VCS.RC.M	Vertical solid door	Remote-condensing	Medium temperature	$0.11 \times V + 0.26$	AHRI 1200
VCS.RC.L	Vertical solid door	Remote-condensing	Low temperature	$0.23 \times V + 0.54$	AHRI 1200
VCS.RC.I	Vertical solid door	Remote-condensing	Ice cream	$0.27 \times V + 0.63$	AHRI 1200
HCS.RC.M	Horizontal solid door	Remote-condensing	Medium temperature	$0.11 \times V + 0.26$	AHRI 1200
HCS.RC.L	Horizontal solid door	Remote-condensing	Low temperature	$0.23 \times V + 0.54$	AHRI 1200
HCS.RC.I	Horizontal solid door	Remote-condensing	Ice cream	$0.27 \times V + 0.63$	AHRI 1200
HCS.RC.I	Horizontal solid door	Remote-condensing	Ice cream	$0.27 \times V + 0.63$	AHRI 1200
SOC.RC.L	Service over counter	Remote-condensing	Low temperature	$1.08 \times TDA + 0.22$	AHRI 1200
SOC.RC.I	Service over counter	Remote-condensing	Ice cream	$1.26 \times TDA + 0.26$	AHRI 1200
VOP.SC.L	Vertical open	Self-contained	Low temperature	$4.37 \times TDA + 11.82$	AHRI 1200
VOP.SC.I	Vertical open	Self-contained	Ice cream	$5.55 \times TDA + 15.02$	AHRI 1200
SVO.SC.L	Semivertical open	Self-contained	Low temperature	$4.34 \times TDA + 11.51$	AHRI 1200
SVO.SC.I	Semivertical open	Self-contained	Ice cream	$5.52 \times TDA + 14.63$	AHRI 1200
HZO.SC.I	Horizontal open	Self-contained	Ice cream	$2.44 \times TDA + 9.0$	AHRI 1200
SOC.SC.I	Service over counter	Self-contained	Ice cream	$1.76 \times TDA + 0.36$	AHRI 1200
HCS.SC.I	Horizontal solid door	Self-contained	Ice cream	$0.38 \times V + 0.88$	AHRI 1200

a. *Equipment* class designations consist of a combination (in sequential order separated by periods (AAA).(BB).(C)) of the following:

—(AAA)—An *equipment* family code (VOP = vertical open, SVO = semivertical open, HZO = horizontal open, VCT = vertical transparent doors, VCS = vertical solid doors, HCT = horizontal transparent doors, HCS = horizontal solid doors, and SOC = service over counter); (BB)—An operating mode code (RC = remote condensing and SC = self contained); and (C)—A rating temperature code (M = medium temperature [38°F], L = low temperature [0°F], or I = ice cream temperature [15°F]). For example, "VOP.RC.M" refers to the "vertical open, remote condensing, medium temperature" *equipment* class.

b. V is the volume of the case (ft) as measured in AHRI Standard 1200, [Appendix C](#).

c. TDA is the total display area of the case (ft) as measured in AHRI Standard 1200, [Appendix D](#).

*Insert the new revised IP table*

**Table 6.8.1-13 Commercial Refrigerators, Freezers and Refrigeration—Minimum Efficiency Requirements**

Equipment Category	Condensing Unit Configuration	Equipment Family	Rating Temp (F)	Operating Temp (F)	Equipment Classification <sup>c</sup>	Maximum daily energy consumption kWh/day <sup>d,e</sup>	Test Standard
Remote Condensing Commercial Refrigerators and Commercial Freezers	Remote (RC)	Vertical Open (VOP)	38 (M)	≥32	VOP.RC.M	0.64 x TDA + 4.07	AHRI 1200
			0 (L)	<32	VOP.RC.L	2.20 x TDA + 6.85	
		Semivertical Open (SVO)	38 (M)	≥32	SVO.RC.M	0.66 x TDA + 3.18	
			0 (L)	<32	SVO.RC.L	2.20 x TDA + 6.85	
		Horizontal Open (HZO)	38 (M)	≥32	HZO.RC.M	0.35 x TDA + 2.88	
			0 (L)	<32	HZO.RC.L	0.55 x TDA + 6.88	
		Vertical Closed Transparent (VCT)	38 (M)	≥32	VCT.RC.M	0.15 x TDA + 1.95	
			0 (L)	<32	VCT.RC.L	0.49 x TDA + 2.61	
		Horizontal Closed Transparent (HCT)	38 (M)	≥32	HCT.RC.M	0.16 x TDA + 0.13	
			0 (L)	<32	HCT.RC.L	0.34 x TDA + 0.26	
		Vertical Closed Solid (VCS)	38 (M)	≥32	VCS.RC.M	0.10 x V + 0.26	
			0 (L)	<32	VCS.RC.L	0.21 x V + 0.54	
		Horizontal Closed Solid (HCS)	38 (M)	≥32	HCS.RC.M	0.10 x V + 0.26	
			0 (L)	<32	HCS.RC.L	0.21 x V + 0.54	
Service Over Counter (SOC)	38 (M)	≥32	SOC.RC.M	0.44 x TDA + 0.11			
	0 (L)	<32	SOC.RC.L	0.93 x TDA + 0.22			
Self-Contained Commercial Refrigerators and Commercial Freezers with and Without Doors	Self-Contained (SC)	Vertical Open (VOP)	38 (M)	≥32	VOP.SC.M	1.69 x TDA + 4.71	AHRI 1200
			0 (L)	<32	VOP.SC.L	4.25 x TDA + 11.82	
		Semivertical Open (SVO)	38 (M)	≥32	SVO.SC.M	1.70 x TDA + 4.59	
			0 (L)	<32	SVO.SC.L	4.26 x TDA + 11.51	
		Horizontal Open (HZO)	38 (M)	≥32	HZO.SC.M	0.72 x TDA + 5.55	
			0 (L)	<32	HZO.SC.L	1.90 x TDA + 7.08	
		Vertical Closed Transparent (VCT)	38 (M)	≥32	VCT.SC.M	0.10 x V + 0.86	
			0 (L)	<32	VCT.SC.L	0.29 x V + 2.95	
		Vertical Closed Solid (VCS)	38 (M)	≥32	VCS.SC.M	0.05 x V + 1.36	
			0 (L)	<32	VCS.SC.L	0.22 x V + 1.38	
		Horizontal Closed Transparent (HCT)	38 (M)	≥32	HCT.SC.M	0.06 x V + 0.37	
			0 (L)	<32	HCT.SC.L	0.08 x V + 1.23	
		Horizontal Closed Solid (HCS)	38 (M)	≥32	HCS.SC.M	0.05 x V + 0.91	
			0 (L)	<32	HCS.SC.L	0.06 x V + 1.12	
Service Over Counter (SOC)	38 (M)	≥32	SOC.SC.M	0.52 x TDA + 1.00			
	0 (L)	<32	SOC.SC.L	1.10 x TDA + 2.10			
Self-Contained Commercial Refrigerators with Transparent Doors for Pull-Down Temperature Applications	Self-Contained (SC)	Pull-Down (PD)	38 (M)	≥32	PD.SC.M	0.11 x V + 0.81	AHRI 1200
Commercial Ice-Cream Freezers	Remote (RC)	Vertical Open (VOP)	-15 (I)	≤-5 <sup>b</sup>	VOP.RC.I	2.79 x TDA + 8.70	AHRI 1200
			Semivertical Open (SVO)	-15 (I)	≤-5 <sup>b</sup>	SVO.RC.I	
		Horizontal Open (HZO)	-15 (I)	≤-5 <sup>b</sup>	HZO.RC.I	0.7 x TDA + 8.74	
		Vertical Closed Transparent (VCT)	-15 (I)	≤-5 <sup>b</sup>	VCT.RC.I	0.58 x TDA + 3.05	

		<u>Horizontal Closed Transparent (HCT)</u>	<u>-15 (I)</u>	<u>≤-5<sup>b</sup></u>	<u>HCT.RC.I</u>	<u>0.4 x TDA + 0.31</u>	<u>AHRI 1200</u>
		<u>Vertical Closed Solid (VCS)</u>	<u>-15 (I)</u>	<u>≤-5<sup>b</sup></u>	<u>VCS.RC.I</u>	<u>0.25 x V + 0.63</u>	
		<u>Horizontal Closed Solid (HCS)</u>	<u>-15 (I)</u>	<u>≤-5<sup>b</sup></u>	<u>HCS.RC.I</u>	<u>0.25 x V + 0.63</u>	
		<u>Service Over Counter (SOC)</u>	<u>-15 (I)</u>	<u>≤-5<sup>b</sup></u>	<u>SOC.RC.I</u>	<u>1.09 x TDA + 0.26</u>	
	<u>Self-Contained (SC)</u>	<u>Vertical Open (VOP)</u>	<u>-15 (I)</u>	<u>≤-5<sup>b</sup></u>	<u>VOP.SC.I</u>	<u>5.4 x TDA + 15.02</u>	
		<u>Semivertical Open (SVO)</u>	<u>-15 (I)</u>	<u>≤-5<sup>b</sup></u>	<u>SVO.SC.I</u>	<u>5.41 x TDA + 14.63</u>	
		<u>Horizontal Open (HZO)</u>	<u>-15 (I)</u>	<u>≤-5<sup>b</sup></u>	<u>HZO.SC.I</u>	<u>2.42 x TDA 9.00</u>	
		<u>Vertical Closed Transparent (VCT)</u>	<u>-15 (I)</u>	<u>≤-5<sup>b</sup></u>	<u>VCT.SC.I</u>	<u>0.62 x TDA 3.29</u>	
		<u>Horizontal Closed Transparent (HCT)</u>	<u>-15 (I)</u>	<u>≤-5<sup>b</sup></u>	<u>HCT.SC.I</u>	<u>0.56 x TDA + 0.43</u>	
		<u>Vertical Closed Solid (VCS)</u>	<u>-15 (I)</u>	<u>≤-5<sup>b</sup></u>	<u>VCS.SC.I</u>	<u>0.34 x V + 0.88.</u>	
		<u>Horizontal Closed Solid (HCS)</u>	<u>-15 (I)</u>	<u>≤-5<sup>b</sup></u>	<u>HCS.SC.I</u>	<u>0.34 x V + 0.88.</u>	
		<u>Service Over Counter (SOC)</u>	<u>-15 (I)</u>	<u>≤-5<sup>b</sup></u>	<u>SOC.SC.I</u>	<u>1.53 x TDA + 0.36</u>	

- a. The meaning of the letters in this column is indicated in the columns to the left.
- b. Ice-cream freezer is defined in 10 CFR 431.62 as a commercial freezer that is designed to operate at or below -5 °F and that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of ice cream.
- c. Equipment class designations consist of a combination (in sequential order separated by periods (AAA).(BB).(C)) of the following: (AAA)—An equipment family code (VOP = vertical open, SVO = semivertical open, HZO = horizontal open, VCT = vertical closed transparent doors, VCS = vertical closed solid doors, HCT = horizontal closed transparent doors, HCS = horizontal closed solid doors, and SOC = service over counter); (BB)—An operating mode code (RC = remote condensing and SC = self-contained); and (C)—A rating temperature code (M = medium temperature [38°F], L = low temperature [0°F], or I = ice cream temperature [-15°F]). For example, “VOP.RC.M” refers to the “vertical open, remote condensing, medium temperature” equipment class.
- d. V is the volume of the case (ft<sup>3</sup>) as measured in AHRI Standard 1200, Appendix C.
- e. TDA is the total display area of the case (ft<sup>2</sup>) as measured in AHRI Standard 1200, Appendix D.

**Delete the current SI table 6.8.1-12 and integrate the new table into table 6.8.1-13**

**Table 6.8.1-12 Commercial Refrigerator and Freezers—Minimum Efficiency Requirements**

<i>Equipment Type</i>	<i>Application</i>	<i>Energy Use Limits, kWh/day</i>	<i>Test Procedure</i>
Refrigerator with solid doors	Holding temperature	$3.53 \times V + 2.04$	AHRI 1200
Refrigerator with transparent doors	Holding temperature	$4.24 \times V + 3.34$	AHRI 1200
Freezers with solid doors	Holding temperature	$14.13 \times V + 1.38$	AHRI 1200
Freezers with transparent doors	Holding temperature	$26.49 \times V + 4.10$	AHRI 1200
Refrigerators/freezers with solid doors	Holding temperature	the greater of $4.24 \times V + 3.34$ or 0.70	AHRI 1200
Commercial refrigerators	Pulldown	$4.45 \times V + 3.51$	AHRI 1200

*V* = the chiller or frozen compartment volume (m<sup>3</sup>) as defined in Association of Home Appliance Manufacturers Standard HRF-1.

**Delete the current SI table 6.8.1-13 and insert a new table that is a combination of 6.8.1-12 and 6.8.1-17**

**Table 6.8.1-13 Commercial Refrigeration—Minimum Efficiency Requirements (Continued)**

<i>Equipment Type</i>		<i>Operating Mode</i>	<i>Rating Temperature</i>	<i>Energy Use Limits<sup>b,c</sup>, kWh/day</i>	<i>Test Procedure</i>
<i>Equipment Class<sup>a</sup></i>	<i>Family Code</i>				
VOP.RC.M	Vertical open	Remote condensing	Medium temperature	$8.83 \times TDA + 4.07$	AHRI 1200
SVO.RC.M	Semivertical open	Remote condensing	Medium temperature	$8.93 \times TDA + 3.18$	AHRI 1200
HZO.RC.M	Horizontal open	Remote condensing	Medium temperature	$3.77 \times TDA + 2.88$	AHRI 1200
VOP.RC.L	Vertical open	Remote condensing	Low temperature	$24.43 \times TDA + 6.85$	AHRI 1200
HZO.RC.L	Horizontal open	Remote condensing	Low temperature	$6.14 \times TDA + 6.88$	AHRI 1200
VCT.RC.M	Vertical transparent door	Remote condensing	Medium temperature	$2.37 \times TDA + 1.95$	AHRI 1200
VCT.RC.L	Vertical transparent door	Remote condensing	Low temperature	$6.03 \times TDA + 2.61$	AHRI 1200
SOC.RC.M	Service over counter	Remote condensing	Medium temperature	$5.49 \times TDA + 0.11$	AHRI 1200
VOP.SC.M	Vertical open	Self contained	Medium temperature	$18.73 \times TDA + 4.71$	AHRI 1200
SVO.SC.M	Semivertical open	Self contained	Medium temperature	$18.62 \times TDA + 4.59$	AHRI 1200
HZO.SC.M	Horizontal open	Self contained	Medium temperature	$8.29 \times TDA + 5.55$	AHRI 1200
HZO.SC.L	Horizontal open	Self contained	Low temperature	$20.67 \times TDA + 7.08$	AHRI 1200
VCT.SC.I	Vertical transparent door	Self contained	Ice cream	$7.21 \times TDA + 3.29$	AHRI 1200
VCS.SC.I	Vertical solid door	Self contained	Ice cream	$13.42 \times V + 0.88$	AHRI 1200
HCT.SC.I	Horizontal transparent door	Self contained	Ice cream	$6.03 \times TDA + 0.43$	AHRI 1200
SVO.RC.L	Semivertical open	Remote condensing	Low temperature	$24.43 \times TDA + 6.85$	AHRI 1200
VOP.RC.I	Vertical open	Remote condensing	Ice cream	$31.11 \times TDA + 8.7$	AHRI 1200
SVO.RC.I	Semivertical open	Remote condensing	Ice cream	$31.11 \times TDA + 8.7$	AHRI 1200

HZO.RC.I	Horizontal open	Remote condensing	Ice cream	$7.75 \times TDA + 8.74$	AHRI 1200
VCT.RC.I	Vertical transparent door	Remote condensing	Ice cream	$7.10 \times TDA + 3.05$	AHRI 1200
HCT.RC.M	Horizontal transparent door	Remote condensing	Medium temperature	$1.72 \times TDA + 0.13$	AHRI 1200
HCT.RC.L	Horizontal transparent door	Remote condensing	Low temperature	$3.66 \times TDA + 0.26$	AHRI 1200
HCT.RC.I	Horizontal transparent door	Remote condensing	Ice cream	$4.31 \times TDA + 0.31$	AHRI 1200
VCS.RC.M	Vertical solid door	Remote condensing	Medium temperature	$3.88 \times V + 0.26$	AHRI 1200
VCS.RC.L	Vertical solid door	Remote condensing	Low temperature	$8.12 \times V + 0.54$	AHRI 1200
VCS.RC.I	Vertical solid door	Remote condensing	Ice cream	$9.53 \times V + 0.63$	AHRI 1200
HCS.RC.M	Horizontal solid door	Remote condensing	Medium temperature	$3.88 \times V + 0.26$	AHRI 1200
HCS.RC.L	Horizontal solid door	Remote condensing	Low temperature	$8.12 \times V + 0.54$	AHRI 1200
HCS.RC.I	Horizontal solid door	Remote condensing	Ice cream	$9.53 \times V + 0.63$	AHRI 1200
HCS.RC.I	Horizontal solid door	Remote condensing	Ice cream	$9.53 \times V + 0.63$	AHRI 1200
SOC.RC.L	Service over counter	Remote condensing	Low temperature	$11.63 \times TDA + 0.22$	AHRI 1200
SOC.RC.I	Service over counter	Remote condensing	Ice cream	$13.56 \times TDA + 0.26$	AHRI 1200
VOP.SC.L	Vertical open	Self contained	Low temperature	$47.04 \times TDA + 11.82$	AHRI 1200
VOP.SC.I	Vertical open	Self contained	Ice cream	$59.74 \times TDA + 15.02$	AHRI 1200
SVO.SC.L	Semivertical open	Self contained	Low temperature	$46.72 \times TDA + 11.51$	AHRI 1200
SVO.SC.I	Semivertical open	Self contained	Ice cream	$5.52 \times TDA + 14.63$	AHRI 1200
HZO.SC.I	Horizontal open	Self contained	Ice cream	$59.42 \times TDA + 9.0$	AHRI 1200
SOC.SC.I	Service over counter	Self contained	Ice cream	$18.94 \times TDA + 0.36$	AHRI 1200
HCS.SC.I	Horizontal solid door	Self contained	Ice cream	$13.42 \times TDA + 0.88$	AHRI 1200

a. *Equipment* class designations consist of a combination (in sequential order separated by periods (AAA).(BB).(C)) of the following:

— (AAA)—An *equipment* family code (VOP = vertical open, SVO = semivertical open, HZO = horizontal open, VCT = vertical transparent doors, VCS = vertical solid doors, HCT = horizontal transparent doors, HCS = horizontal solid doors, and SOC = service over counter); (BB)—An operating mode code (RC = remote condensing and SC = self contained); and — (C)—A rating temperature code (M = medium temperature [3.3°C], L = low temperature [-17.8°C], or I = ice cream temperature [-9.4°C]). For example, “VOP.RC.M” refers to the “vertical open, remote condensing, medium temperature” *equipment* class.

b. V is the volume of the case (m<sup>3</sup>) as measured in AHRI Standard 1200, [Appendix C](#).

e. TDA is the total display area of the case (m<sup>2</sup>) as measured in AHRI Standard 1200, [Appendix D](#).



*Insert the new revised SI table 6.8.1-13 which is a combination of the old table 6.8.1-12 and 6.8.1-17*

**Table 6.8.1-13 Commercial Refrigerators, Freezer, and Refrigeration—Minimum Efficiency Requirements**

Equipment Category	Condensing Unit Configuration	Equipment Family	Rating Temp (C)	Operating Temp (C)	Equipment Classification <sup>e</sup>	Maximum daily energy consumption kWh/day <sup>d,c</sup>	Test Standard
Remote Condensing Commercial Refrigerators and Commercial Freezers	Remote (RC)	Vertical Open (VOP)	3 (M)	≥0	VOP.RC.M	6.89 x TDA + 4.07	AHRI 1201
			-18 (L)	≤0	VOP.RC.L	23.68 x TDA + 6.85	
		Semivertical Open (SVO)	3 (M)	≥0	SVO.RC.M	7.10 x TDA + 3.18	
			-18 (L)	≤0	SVO.RC.L	23.68 x TDA + 6.85	
		Horizontal Open (HZO)	3 (M)	≥0	HZO.RC.M	3.77 x TDA + 2.88	
			-18 (L)	≤0	HZO.RC.L	5.92 x TDA + 6.88	
		Vertical Closed Transparent (VCT)	3 (M)	≥0	VCT.RC.M	1.61 x TDA + 1.95	
			-18 (L)	≤0	VCT.RC.L	5.27 x TDA + 2.61	
		Horizontal Closed Transparent (HCT)	3 (M)	≥0	HCT.RC.M	1.72 x TDA + 0.13	
			-18 (L)	≤0	HCT.RC.L	3.66 x TDA + 0.26	
		Vertical Closed Solid (VCS)	3 (M)	≥0	VCS.RC.M	3.53 x V + 0.26	
			-18 (L)	≤0	VCS.RC.L	7.42 x V + 0.54	
Horizontal Closed Solid (HCS)	3 (M)	≥0	HCS.RC.M	3.53 x V + 0.26			
	-18 (L)	≤0	HCS.RC.L	7.42 x V + 0.54			
Service Over Counter (SOC)	3 (M)	≥0	SOC.RC.M	4.74 x TDA + 0.11			
	-18 (L)	≤0	SOC.RC.L	10.01 x TDA + 0.22			
Self-Contained Commercial Refrigerators and Commercial Freezers With and Without Doors	Self-Contained (SC)	Vertical Open (VOP)	3 (M)	≥0	VOP.SV.M	18.19 x TDA + 4.71	AHRI 1201
			-18 (L)	≤0	VOP.SC.L	45.75 x TDA + 11.82	
		Semivertical Open (SVO)	3 (M)	≥0	SVO.SC.M	18.30 x TDA + 4.59	
			-18 (L)	≤0	SVO.SC.L	45.85 x TDA + 11.51	
		Horizontal Open (HZO)	3 (M)	≥0	HZO.SC.M	7.75 x TDA + 5.55	
			-18 (L)	≤0	HZO.SC.L	20.45 x TDA + 7.08	
		Vertical Closed Transparent (VCT)	3 (M)	≥0	VCT.SC.M	3.53 x V + 0.86	
			-18 (L)	≤0	VCT.SC.L	10.24 x V + 2.95	
		Vertical Closed Solid (VCS)	3 (M)	≥0	VCS.SC.M	1.77 x V + 1.36	
			-18 (L)	≤0	VCS.SC.L	7.77 x V + 1.38	
		Horizontal Closed Transparent (HCT)	3 (M)	≥0	HCT.SC.M	2.12 x V + 0.37	
			-18 (L)	≤0	HCT.SC.L	2.83 x V + 1.23	
Horizontal Closed Solid (HCS)	3 (M)	≥0	HCS.SC.M	1.77 x V + 0.91			
	-18 (L)	≤0	HCS.SC.L	2.12 x V + 1.12			
Service Over Counter (SOC)	3 (M)	≥0	SOC.SC.M	5.60 x TDA + 1.00			
	-18 (L)	≤0	SOC.SC.L	11.84 x TDA + 2.10			
Self-Contained Commercial Refrigerators with Transparent Doors for Pull-Down Temperature Applications	Self-Contained (SC)	Pull-Down (PD)	3 (M)	≥0	PD.SC.M	3.88 x V + 0.81	AHRI 1201
Commercial Ice-Cream Freezers	Remote (RC)	Vertical Open (VOP)	-26 (I)	≤-20 <sup>b</sup>	VOP.RC.I	30.03 x TDA + 8.70	AHRI 1201
		Semivertical Open (SVO)			SVO.RC.I	30.03 x TDA + 8.70	
		Horizontal Open (HZO)			HZO.RC.I	7.53 x TDA + 8.74	
		Vertical Closed Transparent (VCT)			VCT.RC.I	6.24 x TDA + 3.05	

		Horizontal Closed Transparent (HCT)			HCT.RC.I	$4.31 \times TDA + 0.31$		
		Vertical Closed Solid (VCS)			VCS.RC.I	$8.83 \times V + 0.63$		
		Horizontal Closed Solid (HCS)			HCS.RC.I	$8.83 \times V + 0.63$		
		Service Over Counter (SOC)			SOC.RC.I	$11.73 \times TDA + 0.26$		
	Self-Contained (SC)	Vertical Open (VOP)			VOP.SC.I	$58.13 \times TDA + 15.02$		
		Semivertical Open (SVO)			SVO.SC.I	$58.23 \times TDA + 14.63$		
		Horizontal Open (HZO)			HZO.SC.I	$26.05 \times TDA + 9.00$		
		Vertical Closed Transparent (VCT)			VCT.SC.I	$6.67 \times TDA + 3.29$		
		Horizontal Closed Transparent (HCT)			HCT.SC.I	$6.03 \times TDA + 0.43$		
		Vertical Closed Solid (VCS)			VCS.SC.I	$12.01 \times V + 0.88$		
		Horizontal Closed Solid (HCS)			HCS.SC.I	$12.01 \times V + 0.88$		
		Service Over Counter (SOC)			SOC.SC.I	$16.47 \times TDA + 0.36$		

- 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  $-21^{\circ}\text{C}$  and that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of ice cream.
- Equipment class designations consist of a combination (in sequential order separated by periods (AAA).(BB).(C)) of the following: (AAA)—An equipment family code (VOP = vertical open, SVO = semivertical open, HZO = horizontal open, VCT = vertical closed transparent doors, VCS = vertical closed solid doors, HCT = horizontal transparent doors, HCS = horizontal closed solid doors, and SOC = service over counter); (BB)—An operating mode code (RC = remote condensing and SC = self contained); and (C)—A rating temperature code (M = medium temperature [ $3.3^{\circ}\text{C}$ ], L = low temperature [ $-18^{\circ}\text{C}$ ], or I = ice cream temperature [ $-26.1^{\circ}\text{C}$ ]). For example, "VOP.RC.M" refers to the "vertical open, remote condensing, medium temperature" equipment class.
- V is the volume of the case ( $\text{m}^3$ ) as measured in AHRI Standard 1200, Appendix C.
- TDA is the total display area of the case ( $\text{m}^2$ ) as measured in AHRI Standard 1200, Appendix D.

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**Clean Version representing final Addendum (reference only and not for comment)**

*Other addenda make changes to section 6.4.1 and the combined changes are shown below.*

**6.4.1 Equipment Efficiencies, Verification, and Labeling Requirements**

**6.4.1.1 Minimum Equipment Efficiencies—Listed Equipment—Standard Rating and Operating Conditions**

*Equipment* shown in Tables 6.8.1-1 through 6.8.1-19 shall have a minimum performance at the specified rating conditions when tested in accordance with the specified test procedure. Where multiple rating conditions or performance requirements are provided, the *equipment* shall satisfy all stated requirements unless otherwise exempted by footnotes in the table. *Equipment* covered under the Federal *Energy Policy Act* of 1992 (EPACT) shall have no minimum *efficiency* requirements for operation at minimum capacity or other than standard rating conditions. *Equipment* used to provide *service water-heating* functions as part of a combination *system* shall satisfy all stated requirements for the appropriate *space* heating or cooling category.

Note to staff. In the end we should consider renumber and re-grouping the data to be more user focused

Tables are as follows:

- a. Table 6.8.1-1, “Electrically Operated Unitary Air Conditioners and *Condensing Units*—Minimum *Efficiency* Requirements”
- b. Table 6.8.1-2, “Electrically Operated Air Cooled Unitary ~~and Applied Heat Pumps~~—Minimum *Efficiency* Requirements”
- c. Table 6.8.1-3, “Water-Chilling Packages—*Efficiency* Requirements” (See Section 6.4.1.2 for water-cooled centrifugal water-chilling packages that are designed to operate at nonstandard conditions.)
- d. Table 6.8.1-4, “Electrically Operated *Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, and Single-Package Vertical Heat Pumps, Room Air Conditioners, and Room Air Conditioner Heat Pumps*—Minimum *Efficiency* Requirements”
- e. Table 6.8.1-5, “Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters—Minimum *Efficiency* Requirements”
- f. Table 6.8.1-6, “Gas- and Oil-Fired *Boilers*—Minimum *Efficiency* Requirements”
- g. Table 6.8.1-7, “Performance Requirements for Heat-Rejection *Equipment*”
- h. Table 6.8.1-8, “Heat Transfer *Equipment*”
- i. Table 6.8.1-9, “Electrically Operated Variable-Refrigerant-Flow Air Conditioners—Minimum *Efficiency* Requirements”
- j. Table 6.8.1-10, “Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps—Minimum *Efficiency* Requirements”
- k. Table 6.8.1-11, “Floor Mounted Air Conditioners and *Condensing Units* Serving *Computer Rooms*”
- l. Table 6.8.1-13, “Commercial Refrigeration—Minimum *Efficiency* Requirements”
- m. Table 6.8.1-14, “Vapor-Compression-Based Indoor Pool Dehumidifiers—Minimum *Efficiency* Requirements”
- n. Table 6.8.1-15, “Electrically Operated *DX-DOAS Units, Single-Package and Remote Condenser, without Energy Recovery*—Minimum *Efficiency* Requirements”
- o. Table 6.8.1-16, “Electrically Operated *DX-DOAS Units, Single-Package and Remote Condenser, with Energy Recovery*—Minimum *Efficiency* Requirements”

- p. Table 6.8.1-17, “Electrically Operated Water Source Heat Pumps—Minimum Efficiency Requirements”
- q Table 6.8.1-18 “Heat Pump Chiller Packages – Minimum Heating Efficiency Requirements”
- r Table 6.8.1-19 Ceiling Mounted Computer Room Air Conditioners – Minimum Efficiency Requirements