ADDENDA

ANSI/ASHRAE/IES Addendum ek to
ANSI/ASHRAE/IES Standard 90.1-2013

Energy Standard for Buildings Except Low-Rise Residential Buildings

Approved by the ASHRAE Standards Committee on August 24, 2016; by the ASHRAE Tech Council on August 29, 2016; by the IES Board of Directors on September 26, 2016; and by the American National Standards Institute on August 30, 2016.

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FOREWORD

Addendum ek addresses one update. The update establishes baseline commercial refrigeration limits for Appendix G. The commercial refrigerator and freezer baseline values are based on the California Energy Commission Appliance Efficiency Regulations 2005[1], which prescribe minimum efficiency requirements for refrigerator and freezers purchased in 2004.

The Commercial Refrigeration—Minimum Efficiency Requirements are based on the 2008-12-24 Letter of approval for DOE-CRE Final Rule IBR with Docket No. EERE-2006-BT-STD-0126 CRE Final Rule DRAFT 2008-12-24[2].

[Note: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes.]

Addendum ek to 90.1-2013

Modify the standard as follows (I-P):

TABLE G3.1 Modeling Requirements for Calculating Proposed and Baseline Building Performance

No.	***Proposed Building Performance***	***Baseline Building Performance***
……..		
16	***Refrigeration***	
	The *proposed building design* shall be modeled using the actual equipment capacities and efficiencies.	Where refrigeration equipment is specified in the *proposed building design* and listed in Tables G3.10.1-G3.10.2, the *baseline building design* shall be modeled as specified in Tables G3.10.1-G3.10.2 using the actual equipment capacities. If the refrigeration equipment is not listed in Tables G3.10.1-G3.10.2, the *baseline building design* shall be modeled the same as the proposed.

[1] *http://www.energy.ca.gov/2005publications/CEC-400-2005-012/CEC-400-2005-012.PDF*
[2] *http://www.regulations.gov/#!documentDetail;D=EERE-2006-STD-0126-0074*

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Add the following tables (I-P):

TABLE G3.10.1 Performance Rating Method—Commercial Refrigerator and Freezers

Equipment Type	Application	Energy Use Limits, kWh/day	Test Procedure
Refrigerator with solid doors	Holding Temperature	0.125 × *V* + 2.76	AHRI 1200
Refrigerator with transparent doors		0.172 × *V* + 4.77	
Freezers with solid doors		0.398 × *V* + 2.28	
Freezers with transparent doors		0.94 × *V* + 5.10	
Refrigerators/freezers with solid doors		0.12 × *V* + 4.77	
Commercial refrigerators	Pulldown	0.181 × *V* + 5.01	

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

TABLE G3.10.2 Performance Rating Method—Commercial Refrigeration

Equipment Type				Energy Use Limits,[b,c] kWh/day	Test Procedure
Equipment Class[a]	Family Code	Operating Mode	Rating Temperature		
VOP.RC.M	Vertical open	Remote condensing	Medium temperature	1.01 × TDA + 4.07	AHRI 1200
SVO.RC.M	Semivertical open	Remote condensing	Medium temperature	1.01 × TDA + 3.18	
HZO.RC.M	Horizontal open	Remote condensing	Medium temperature	0.51 × TDA + 2.88	
VOP.RC.L	Vertical open	Remote condensing	Low temperature	2.84 × TDA + 6.85	
HZO.RC.L	Horizontal open	Remote condensing	Low temperature	0.68 × TDA + 6.88	
VCT.RC.M	Vertical transparent door	Remote condensing	Medium temperature	0.48 × TDA + 1.95	
VCT.RC.L	Vertical transparent door	Remote condensing	Low temperature	1.03 × TDA + 2.61	
SOC.RC.M	Service over counter	Remote condensing	Medium temperature	0.62 × TDA + 0.11	
VOP.SC.M	Vertical open	Self-contained	Medium temperature	2.34 × TDA + 4.71	
SVO.SC.M	Semivertical open	Self-contained	Medium temperature	2.23 × TDA + 4.59	
HZO.SC.M	Horizontal open	Self-contained	Medium temperature	1.14 × TDA + 5.55	
HZO.SC.L	Horizontal open	Self-contained	Low temperature	2.63 × TDA + 7.08	
VCT.SC.I	Vertical transparent door	Self-contained	Ice cream	1.63 × TDA + 3.29	
VCS.SC.I	Vertical solid door	Self-contained	Ice cream	0.55 × *V* + 0.88	
HCT.SC.I	Horizontal transparent door	Self-contained	Ice cream	1.33 × TDA + 0.43	
SVO.RC.L	Semivertical open	Remote condensing	Low temperature	2.84 × TDA + 6.85	
VOP.RC.I	Vertical open	Remote condensing	Ice cream	3.6 × TDA + 8.7	
SVO.RC.I	Semivertical open	Remote condensing	Ice cream	3.6 × TDA + 8.7	
HZO.RC.I	Horizontal open	Remote condensing	Ice cream	0.87 × TDA + 8.74	
VCT.RC.I	Vertical transparent door	Remote condensing	Ice cream	1.2 × TDA + 3.05	

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^3) as measured in AHRI Standard 1200, Appendix C.
c. TDA is the total display area of the case (ft^2) as measured in AHRI Standard 1200, Appendix D.

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TABLE G3.10.2 Performance Rating Method—Commercial Refrigeration *(Continued)*

Equipment Type				Energy Use Limits,[b,c]	Test Procedure
Equipment Class[a]	Family Code	Operating Mode	Rating Temperature	kWh/day	
HCT.RC.M	Horizontal transparent door	Remote condensing	Medium temperature	0.39 × TDA + 0.13	AHRI 1200
HCT.RC.L	Horizontal transparent door	Remote condensing	Low temperature	0.81 × TDA + 0.26	
HCT.RC.I	Horizontal transparent door	Remote condensing	Ice cream	0.95 × TDA + 0.31	
VCS.RC.M	Vertical solid door	Remote condensing	Medium temperature	0.16 × *V* + 0.26	
VCS.RC.L	Vertical solid door	Remote condensing	Low temperature	0.33 × *V* + 0.54	
VCS.RC.I	Vertical solid door	Remote condensing	Ice cream	0.39 × *V* + 0.63	
HCS.RC.M	Horizontal solid door	Remote condensing	Medium temperature	0.16 × *V* + 0.26	
HCS.RC.L	Horizontal solid door	Remote condensing	Low temperature	0.33 × *V* + 0.54	
HCS.RC.I	Horizontal solid door	Remote condensing	Ice cream	0.39 × *V* + 0.63	
SOC.RC.L	Service over counter	Remote condensing	Low temperature	1.3 × TDA + 0.22	
SOC.RC.I	Service over counter	Remote condensing	Ice cream	1.52 × TDA + 0.26	
VOP.SC.L	Vertical open	Self-contained	Low temperature	5.87 × TDA + 11.82	
VOP.SC.I	Vertical open	Self-contained	Ice cream	7.45 × TDA + 15.02	
SVO.SC.L	Semivertical open	Self-contained	Low temperature	5.59 × TDA + 11.51	
SVO.SC.I	Semivertical open	Self-contained	Ice cream	7.11 × TDA + 14.63	
HZO.SC.I	Horizontal open	Self-contained	Ice cream	3.35 × TDA + 9.0	
SOC.SC.I	Service over counter	Self-contained	Ice cream	2.13 × TDA + 0.36	
HCS.SC.I	Horizontal solid door	Self-contained	Ice cream	0.55 × *V* + 0.88	

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^3) as measured in AHRI Standard 1200, Appendix C.
c. TDA is the total display area of the case (ft^2) as measured in AHRI Standard 1200, Appendix D.

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Add the following Tables (SI):

TABLE G3.10.1 Performance Rating Method— Commercial Refrigerator and Freezers

Equipment Type	Application	Energy Use Limits, kWh/day	Test Procedure
Refrigerator with solid doors	Holding Temperature	1.35 × *V* + 2.76	AHRI 1200
Refrigerator with transparent doors		1.85 × *V* + 4.77	
Freezers with solid doors		4.28 × *V* + 2.28	
Freezers with transparent doors		10.12 × *V* + 5.10	
Refrigerators/freezers with solid doors		1.29 × *V* + 4.77	
Commercial refrigerators	Pulldown	1.95 × *V* + 5.01	

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

TABLE G3.10.2 Performance Rating Method—Commercial Refrigeration

Equipment Type				Energy Use Limits,[b,c] kWh/day	Test Procedure
Equipment Class[a]	Family Code	Operating Mode	Rating Temperature		
VOP.RC.M	Vertical open	Remote condensing	Medium temperature	35.67 × TDA + 4.07	AHRI 1200
SVO.RC.M	Semivertical open	Remote condensing	Medium temperature	35.67 × TDA + 3.18	
HZO.RC.M	Horizontal open	Remote condensing	Medium temperature	18.01 × TDA + 2.88	
VOP.RC.L	Vertical open	Remote condensing	Low temperature	100.29 × TDA + 6.85	
HZO.RC.L	Horizontal open	Remote condensing	Low temperature	24.01 × TDA + 6.88	
VCT.RC.M	Vertical transparent door	Remote condensing	Medium temperature	16.95 × TDA + 1.95	
VCT.RC.L	Vertical transparent door	Remote condensing	Low temperature	36.37 × TDA + 2.61	
SOC.RC.M	Service over counter	Remote condensing	Medium temperature	21.90 × TDA + 0.11	
VOP.SC.M	Vertical open	Self-contained	Medium temperature	82.64 × TDA + 4.71	
SVO.SC.M	Semivertical open	Self-contained	Medium temperature	78.75 × TDA + 4.59	
HZO.SC.M	Horizontal open	Self-contained	Medium temperature	40.26 × TDA + 5.55	
HZO.SC.L	Horizontal open	Self-contained	Low temperature	92.88 × TDA + 7.08	
VCT.SC.I	Vertical transparent door	Self-contained	Ice cream	57.56 × TDA + 3.29	
VCS.SC.I	Vertical solid door	Self-contained	Ice cream	5.92 × V + 0.88	
HCT.SC.I	Horizontal transparent door	Self-contained	Ice cream	46.97 × TDA + 0.43	
SVO.RC.L	Semivertical open	Remote condensing	Low temperature	100.29 × TDA + 6.85	
VOP.RC.I	Vertical open	Remote condensing	Ice cream	127.13 × TDA + 8.7	
SVO.RC.I	Semivertical open	Remote condensing	Ice cream	127.13 × TDA + 8.7	
HZO.RC.I	Horizontal open	Remote condensing	Ice cream	30.72 × TDA + 8.74	
VCT.RC.I	Vertical transparent door	Remote condensing	Ice cream	42.38 × TDA + 3.05	

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 [-17.3°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^3) as measured in AHRI Standard 1200, Appendix C.
c. TDA is the total display area of the case (m^2) as measured in AHRI Standard 1200, Appendix D.

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TABLE G3.10.2 Performance Rating Method—Commercial Refrigeration *(Continued)*

Equipment Type				Energy Use Limits,[b,c] kWh/day	Test Procedure
Equipment Class[a]	Family Code	Operating Mode	Rating Temperature		
HCT.RC.M	Horizontal transparent door	Remote condensing	Medium temperature	13.77 × TDA + 0.13	AHRI 1200
HCT.RC.L	Horizontal transparent door	Remote condensing	Low temperature	28.60 × TDA + 0.26	
HCT.RC.I	Horizontal transparent door	Remote condensing	Ice cream	33.55 × TDA + 0.31	
VCS.RC.M	Vertical solid door	Remote condensing	Medium temperature	1.72 × V + 0.26	
VCS.RC.L	Vertical solid door	Remote condensing	Low temperature	3.55 × V + 0.54	
VCS.RC.I	Vertical solid door	Remote condensing	Ice cream	4.20 × V + 0.63	
HCS.RC.M	Horizontal solid door	Remote condensing	Medium temperature	1.72 × V + 0.26	
HCS.RC.L	Horizontal solid door	Remote condensing	Low temperature	3.55 × V + 0.54	
HCS.RC.I	Horizontal solid door	Remote condensing	Ice cream	4.20 × V + 0.63	
SOC.RC.L	Service over counter	Remote condensing	Low temperature	45.91 × TDA + 0.22	
SOC.RC.I	Service over counter	Remote condensing	Ice cream	53.68 × TDA + 0.26	
VOP.SC.L	Vertical open	Self-contained	Low temperature	207.30 × TDA + 11.82	
VOP.SC.I	Vertical open	Self-contained	Ice cream	263.09 × TDA + 15.02	
SVO.SC.L	Semivertical open	Self-contained	Low temperature	197.41 × TDA + 11.51	
SVO.SC.I	Semivertical open	Self-contained	Ice cream	251.09 × TDA + 14.63	
HZO.SC.I	Horizontal open	Self-contained	Ice cream	118.30 × TDA + 9	
SOC.SC.I	Service over counter	Self-contained	Ice cream	75.22 × TDA + 0.36	
HCS.SC.I	Horizontal solid door	Self-contained	Ice cream	5.92 × V + 0.88	

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 [-17.3°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^3) as measured in AHRI Standard 1200, Appendix C.
c. TDA is the total display area of the case (m^2) as measured in AHRI Standard 1200, Appendix D.

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ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

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