



ENERGY STAR[®] Program Requirements

Product Specification for Commercial Refrigerators and Freezers

Eligibility Criteria

Final Draft: Version 3.0

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9 Following is the **Final Draft Version 3.0** product specification for ENERGY STAR qualified commercial
10 refrigerators and freezers. A product shall meet all of the identified criteria if it is to earn the ENERGY
11 STAR.

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13 **1) Definitions:** Below are the definitions of the relevant terms in this document. Where applicable, the
14 cited definitions are identical with the definitions in the U.S. Department of Energy's (DOE) regulations
15 found in 10 Part CFR 431.62. When in conflict, the definitions in the Code of Federal Regulations
16 (CFR) take precedence.

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18 A. Commercial Refrigerator, Freezer, and Refrigerator-Freezer: Refrigeration equipment that: (a) is
19 not a consumer product (as defined in §431.2 of part 430); (b) is not designed and marketed
20 exclusively for medical, scientific, or research purposes; (c) operates at a chilled, frozen,
21 combination chilled and frozen, or variable temperature; (d) displays or stores merchandise and
22 other perishable materials horizontally, semi-vertically, or vertically; (e) has transparent or solid
23 doors, sliding or hinged doors, a combination of hinged, sliding, transparent, or solid doors, or no
24 doors; (f) is designed for pull-down temperature applications or holding temperature applications;
25 and (g) is connected to a self-contained condensing unit or to a remote condensing unit.¹

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27 B. Commercial Hybrid Refrigerator, Freezer, and Refrigerator-Freezer: A commercial refrigerator,
28 freezer, or refrigerator-freezer that has two or more chilled and/or frozen compartments that are:
29 (a) in two or more different equipment families, (b) contained in one cabinet, and (c) sold as a
30 single unit.¹

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32 C. Horizontal Closed: Equipment with hinged or sliding doors and a door angle greater than or equal
33 to 45°. ¹

34
35 D. Horizontal Open: Equipment without doors and an air-curtain angle greater than or equal to 80°
36 from the vertical.¹

37
38 E. Vertical Closed: Equipment with hinged or sliding doors and a door angle less than 45°. ¹

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40 F. Vertical Open: Equipment without doors and an air-curtain angle greater than or equal to 0° and
41 less than 10° from the vertical.¹

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43 G. Solid Door Cabinet: A commercial refrigerator, freezer, or refrigerator-freezer in which all outer
44 doors on all sides of the unit are closed solid doors. These doors may be sliding or hinged.

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46 H. Transparent Door Cabinet: A commercial refrigerator, freezer, or refrigerator-freezer in which all
47 outer doors on at least one side of the unit are closed transparent doors. These doors may be
48 sliding or hinged.

49
50 I. Solid Door: A door where less than 75% of the surface area is composed of a transparent
51 material.

52
53 J. Transparent Door: A door with greater than or equal to 75% of the surface area is composed of a
54 transparent material

¹ 10 CFR §431

- 55 K. Ice Cream Freezer: A commercial freezer that is designed to operate at or below -5°F (-21°C) and
56 that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of ice
57 cream.¹
58
- 59 L. Convertible Temperature Equipment: Refrigeration equipment or part thereof that: (a) is not a
60 consumer product (as defined in §431.2 of part 430); (b) is not designed and marketed exclusively
61 for medical, scientific, or research purposes; (c) has one or more compartments that operates at a
62 chilled, frozen, or variable temperature condition between approximately 38°F and 0°F; (d)
63 displays or stores merchandise and other perishable materials horizontally, semi-vertically, or
64 vertically; (e) has hinged transparent and/or solid doors; (f) with a user adjustable application
65 temperature set point within the operating range of 38°F and 0°F; and (g) is connected to a self-
66 contained condensing unit or to a remote condensing unit.
67
- 68 M. Drawer Cabinet: A commercial refrigerator, freezer, or refrigerator-freezer in which one or more
69 drawers are used to access the chilled or frozen compartment or a portion of the chilled or frozen
70 compartment. On equipment with more than one compartment, only one compartment needs to
71 be accessible with the use of a drawer.
72
- 73 N. Prep Table Cabinet: A commercial refrigerator, freezer, or refrigerator-freezer in which a food
74 condiment rail designed to hold open perishable food is located above the chilled or frozen
75 storage compartment or compartments. The condiment rail is designed to hold perishable food
76 product between 33°F and 41°F.
77
- 78 O. Basic Model: All units of a given type of commercial refrigerator, freezer, or refrigerator-freezer (or
79 class thereof) manufactured by one manufacturer that have the same primary energy source,
80 which have electrical characteristics that are essentially identical, and which do not have any
81 differing electrical, physical, or functional characteristics that affect energy consumption.¹
82
- 83 P. Equipment Family: Classification determined by equipment and door orientation, including:
84 Vertical Open (VOP), Semivertical Open (SVO), Horizontal Open (HZO), Vertical Transparent
85 Doors (VCT), Vertical Solid Doors (VCS), Horizontal Transparent Doors (HCT), and Horizontal
86 Solid Doors (HCS).¹
87
- 88 Q. Equipment Class: Commercial refrigerators, freezers, and refrigerator-freezers that are divided
89 into equipment families and further subdivided based on condensing unit configurations and rating
90 temperature designations. For ENERGY STAR included products, these classes include SC, L
91 and SC, M.
92

93 **Note:** All equipment classes that are included in the ENERGY STAR scope are listed in Section 2.A.a-
94 h, below.
95

Note: EPA is committed to aligning all relevant terms and definitions with the DOE Commercial Refrigeration Equipment test procedure standard. EPA will amend the definitions and associated references once the final test procedure is published.

Based on stakeholder feedback that it was confusing, EPA has removed the term and definition of Door Angle. Although DOE uses the term in 10 CFR §431, calculating the door angle is not a necessary requirement for determining eligibility under this ENERGY STAR specification.

In Draft 2, a definition for Convertible Temperature Equipment was proposed for purposes of clarifying EPA's intent to exclude this product type. Based on stakeholder feedback, EPA has amended this definition and also added definitions for Drawer Cabinets and Prep Table Cabinets.

In an effort to further clarify the terms Equipment Family and Equipment Class, EPA has added definitions derivative of the language found in the DOE's 10 CFR §431. A note has also been added under Section 1.R, above, indicating where the equipment classes included in the ENERGY STAR scope are listed.

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99 **2) Scope:**

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101 A. Included Products: Products that meet the definitions of a Commercial Refrigerator, Freezer, and
102 Refrigerator-Freezer or a Commercial Hybrid Refrigerator, Freezer, and Refrigerator-Freezer and
103 are among the following equipment classes are eligible for ENERGY STAR qualification, with the
104 exception of products listed in Section 2.B:

- 105
106 a) Horizontal Closed Solid Self Contained Low Temperature (HCS SC L),
107 b) Horizontal Closed Solid Self Contained Medium Temperature (HCS SC M),
108 c) Horizontal Closed Transparent Self Contained Low Temperature (HCT SC L),
109 d) Horizontal Closed Transparent Self Contained Medium Temperature (HCT SC M),
110 e) Vertical Closed Solid Self Contained Low Temperature (VCS SC L),
111 f) Vertical Closed Solid Self Contained Medium Temperature (VCS SC M),
112 g) Vertical Closed Transparent Self Contained Low Temperature (VCT SC L), and/or
113 h) Vertical Closed Transparent Self Contained Medium Temperature (VCT SC M).

114
115 Examples of product types that are eligible for qualification include: reach-in, roll-in, or pass-
116 through units; merchandisers; under-counter units; hybrid units; milk coolers; back bar coolers;
117 bottle coolers; glass frosters; deep well units; beer-dispensing or direct draw units; and bunker
118 freezers.

119
120 To be eligible for this specification, commercial refrigeration equipment shall be commercial-grade
121 and third-party certified to the applicable requirements set forth in the following quality and safety
122 standards:

- 123
124 a. ANSI/NSF International Standard for Food Equipment – Commercial Refrigerators and
125 Freezers (ANSI/NSF 7-2009); and
126
127 b. UL Standard for Commercial Refrigerators and Freezers (UL-471).

128
129 **Note:** ANSI/NSF 7-2009 exempts equipment from some temperature performance requirements
130 based on the type of food that is intended to be stored in the unit. Examples of equipment that
131 would be exempt from the temperature performance requirements of this Standard include:
132 refrigerators intended only for the storage or display of non-potentially hazardous bottled or
133 canned products and refrigerators intended only for the display of unprocessed produce. Please
134 refer to ANSI/NSF 7-2009 to determine the applicable requirements for a specific equipment type.

135
136 B. Excluded Products: Drawer cabinets, prep tables, service over counter equipment, horizontal
137 open equipment, vertical open equipment, semi-vertical open equipment, convertible temperature
138 equipment, and ice cream freezers are not eligible for ENERGY STAR. Products that are covered
139 under other ENERGY STAR product specifications (e.g. Residential Refrigerators and Freezers,
140 Hot Food Holding Cabinets) are not eligible for qualification under this specification.

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Note: Stakeholders provided additional comments suggesting that EPA should consider expanding the
Commercial Refrigerators and Freezers Version 3.0 specification scope to include other commercial
refrigeration equipment subject to federal regulations.

EPA may consider expanding the scope to include additional commercial refrigeration equipment,
including drawer cabinets, in future versions of this specification if a robust data set is made available that
demonstrates significant product differentiation and energy saving potential.

150 **3) Qualification Criteria:**

151 A. Maximum Daily Energy Consumption Requirements:

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Table 1: ENERGY STAR Requirements for Commercial Refrigerators, Freezers, and Refrigerator-Freezer ²		
Product Volume (in cubic feet)	Refrigerator	Freezer
Vertical Closed		
<i>Solid Door Cabinets</i>	VCS.SC.M*	VCS.SC.L
0 < V < 15	0.02V+1.60	0.25V+1.55
15 ≤ V < 30	0.09V+0.55	0.20V+2.30
30 ≤ V < 50	0.01V+2.95	0.25V+0.80
50 ≤ V	0.06V+0.45	0.14V+6.30
<i>Transparent Door Cabinets</i>	VCT.SC.M	VCT.SC.L
0 < V < 15	0.10V+1.07	0.56V+1.61
15 ≤ V < 30	0.15V+0.32	0.30V+5.50
30 ≤ V < 50	0.06V+3.02	0.55V-2.00
50 ≤ V	0.08V+2.02	0.32V+9.49
Horizontal Closed		
<i>Solid or Transparent Door Cabinets</i>	HCT.SC.M, HCS.SC.M	HCT.SC.L, HCS.SC.L
All volumes	0.06V+0.60	0.10V+0.20

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- * DOE Equipment Class designations relevant to ENERGY STAR eligible product scope
- (1) Equipment family code (HCS= horizontal closed solid, HCT=horizontal closed transparent, VCS= vertical closed solid, VCT=vertical closed transparent),
 - (2) Operating mode (SC=self-contained), and
 - (3) Rating Temperature (M=medium temperature (38 °F), L=low temperature (0 °F)).

Note: EPA received overall stakeholder support for the performance criteria as proposed in the Draft 2 specification. However, there were additional suggestions provided to EPA for consideration. One stakeholder commented that additional factors (i.e., configuration) should be taken into account when determining the MDEC criteria. When developing the levels, EPA made a concentrated effort to ensure that models of various sizes and configurations will meet the Version 3.0 levels, thus providing several options based on the customers' specific needs and applications and obviating the need for different treatment for different configurations.

EPA received a stakeholder comment suggesting that holding commercial refrigeration equipment that operates on natural refrigerants to the same performance standards as HFC-based equipment is biased and creates a disincentive for industry to move forward toward the development of more environmentally friendly HFC-free designs. EPA received a request that refrigeration equipment using natural refrigerants (e.g., R744) not be subject to the proposed levels set forth in Version 3.0 and instead, need only to meet the current Version 2.1 levels to retain ENERGY STAR certified status.

EPA is supportive of the implementation of natural refrigerants in commercial refrigeration equipment. Several models that employ natural refrigerants will meet the Version 3.0 performance criteria. Additionally, manufacturers have informed EPA that the industry is further shifting in the direction of natural refrigerants, which according to some internal test data, result in greater efficiencies.

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B. Determination of Refrigerated Volume: The refrigerated volume (V) of a refrigerator or freezer shall be calculated in accordance with the DOE test procedure in 10 CFR §431.64.

² The operating temperature range for commercial refrigerators and freezers is located at 10 CFR Part 431.66 (d)

- 164 C. Determining Maximum Daily Energy Consumption for Commercial Hybrid Refrigerator, Freezer,
165 and Refrigerator-Freezer: This section applies to Commercial Hybrid Refrigerator, Freezer, and
166 Refrigerator-Freezer, which is a commercial refrigerator, freezer, or refrigerator-freezer with a
167 mixture of solid and transparent external doors with one or more compartments contained in a
168 single cabinet. The maximum daily energy consumption (MDEC) of hybrid equipment shall be the
169 sum of all individual compartment MDEC values. For purposes of hybrid equipment,
170 compartments are defined by the refrigerated volume associated with the different exterior door
171 types. The interior of these compartments may or may not be physically separated.

172
173 The refrigerated volume of each individual compartment shall be measured, and its MDEC limit
174 determined, based on the compartment's volume and door type, as listed in Table 1 above. The
175 sum of the volumes of each compartment shall be equivalent to the total volume of the cabinet.
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Note: DOE's published test procedure NOPR proposes a revised definition of hybrid equipment. EPA will amend the definition and associated references once the final test procedure is published.

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178 **Example:** Consider a vertical closed refrigeration cabinet with a total volume of 50 cubic feet with
179 one transparent half door and one solid half door on the same side. The MDEC of the equipment
180 would be the sum of the MDEC for the two compartments. The requirement used to calculate the
181 MDEC for each compartment is based on the compartment's volume and door type:

182
183 Transparent Door MDEC: $(25 \text{ cu. ft.} \times 0.15) + 0.32 = 4.07 \text{ kWh/day}$

184 Solid Door MDEC: $(25 \text{ cu. ft.} \times 0.09) + 0.55 = 2.80 \text{ kWh/day}$

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186 MDEC for entire cabinet: $4.07 \text{ kWh/day} + 2.80 \text{ kWh/day} = 6.87 \text{ kWh/day}$
187

- 188 C. Significant Digits and Rounding:

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190 a. All calculations shall be carried out with directly measured (unrounded) values. Final
191 ratings for daily energy consumption should be rounded to 0.01 kWh increments in
192 accordance with the DOE test procedure provisions.
193
194 b. Directly measured or calculated values that are submitted for reporting on the ENERGY
195 STAR website shall be calculated in accordance with the requirements for determining
196 certified ratings for DOE.
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198 4) Test Requirements:

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200 A. One of the following sampling plans shall be used to test energy performance for qualification to
201 ENERGY STAR:
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203 a. A single unit is selected, obtained, and tested. The measured performance of this unit and
204 of each subsequent unit manufactured must be equal to or better than the ENERGY
205 STAR specification requirements. Results of the tested unit may be used to qualify
206 additional individual model variations within a basic model as long as the definition for
207 basic model provided in Section 1, above, is met; or
208
209 b. Units are selected for testing and results calculated according to the sampling
210 requirements defined in 10 CFR Part 429, Subpart B §§ 429.11 and 429.42. The certified
211 rating must be equal to or better than the ENERGY STAR specification requirements.
212 Results of the tested unit may be used to qualify additional model variations within a basic
213 model as long as the additional model variations meet the definition for basic model
214 provided in Section 1.N, above. Further, all individual models within a basic model must
215 have the same certified rating per DOE's regulations in Part 429 and this rating must be
216 used for all manufacturer literature, the qualified product list, and certification of
217 compliance to DOE energy conservation standards.
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219 B. When testing commercial refrigerators and freezers, the following test methods shall be used to
220 determine ENERGY STAR qualification:
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Table 2: Test Methods for ENERGY STAR Qualification	
ENERGY STAR Requirement	Test Method Reference
Daily Energy Consumption (DEC)	10 CFR Part 431 Subpart C, 10 CFR Part 431.64 and 10 CFR Part 431.66(d)

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223 **Note:** Once the DOE's final test method is published, EPA will update this specification to reference the
224 amended test method and definitions in order to align with the DOE standard and requirements.
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Note: DOE published a test procedure NOPR on October 28, 2013. The revised test procedure will not be finalized until sometime after this specification is finalized. EPA will amend the final specification with the updated test method references and any applicable definitions once a new test procedure is published.

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227 **Note:** Only those test procedures in 10 CFR §431.64 relevant to horizontal closed and vertical closed
228 refrigerators, freezers, and refrigerator-freezers are applicable to this specification. Total energy
229 consumption of the product shall be measured, which includes both the auxiliary energy and
230 refrigeration energy consumption.
231

232 **5) Effective Date:** The ENERGY STAR Commercial Refrigerator and Freezer Version 3.0 specification
233 shall take effect on **October 1, 2014**. To qualify for ENERGY STAR, a product model shall meet the
234 ENERGY STAR specification in effect on the model's date of manufacture. The date of manufacture
235 is specific to each unit and is the date on which a unit is considered to be completely assembled.
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Note: EPA plans on finalizing this specification by the end of 2013. As such, an effective date of October 1, 2014 is proposed above. Once finalized, manufacturers may immediately begin submitting products for third party certification under the new Version 3.0.

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238 **6) Future Specification Revisions:** EPA reserves the right to change the specification should
239 technological and/or market changes affect its usefulness to consumers, industry, or the environment.
240 In keeping with current policy, revisions to the specification are arrived at through industry
241 discussions. In the event of a specification revision, please note that ENERGY STAR qualification is
242 not automatically granted for the life of a product model.