



# ENERGY STAR® Program Requirements Product Specification for Commercial Refrigerators and Freezers

## Eligibility Criteria Draft 1: Version 3.0

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9 Following is the **Draft 1 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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**Note:** The primary objectives of this specification revision are to: The primary objectives of this revision are to: 1) reevaluate the ENERGY STAR eligibility criteria, ensuring that the ENERGY STAR continues to provide differentiation in the marketplace; and 2) align ENERGY STAR definitions and testing requirements with those established in the U.S. Department of Energy (DOE) Final Rule for Commercial Refrigeration Equipment (Federal Register, 77 FR 10292, 10318, February 21, 2012, Subpart C of 10 CFR Part 431). Stakeholders may offer additional recommendations for revisions to this specification for EPA consideration.

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14 **1) Definitions:** Below are the definitions of the relevant terms in this document. Where applicable, the  
15 cited definitions are identical with the definitions in DOE's regulations found in 10 Part CFR 431.62.

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17 A. Commercial Refrigerator, Freezer, and Refrigerator-Freezer: Refrigeration equipment that: (a) is  
18 not a consumer product (as defined in §431.2 of part 430); (b) is not designed and marketed  
19 exclusively for medical, scientific, or research purposes; (c) operates at a chilled, frozen,  
20 combination chilled and frozen, or variable temperature; (d) displays or stores merchandise and  
21 other perishable materials horizontally, semi-vertically, or vertically; (e) has transparent or solid  
22 doors, sliding or hinged doors, a combination of hinged, sliding, transparent, or solid doors, or no  
23 doors; (f) is designed for pull-down temperature applications or holding temperature applications;  
24 and (g) is connected to a self-contained condensing unit or to a remote condensing unit.<sup>1</sup>  
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26 B. Commercial Hybrid Refrigerator, Freezer, and Refrigerator-Freezer: A commercial refrigerator,  
27 freezer, or refrigerator-freezer that has two or more chilled and/or frozen compartments that are:  
28 (a) in two or more different equipment families, (b) contained in one cabinet, and (c) solid as a  
29 single unit.<sup>1</sup>  
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31 C. Horizontal Closed: Equipment with hinged or sliding doors and a door angle greater than or equal  
32 to 45°.<sup>1</sup>  
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34 D. Horizontal Open: Equipment without doors and an air-curtain angle greater than or equal to 80°  
35 from the vertical.<sup>1</sup>  
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37 E. Vertical Closed: Equipment with hinged or sliding doors and a door angle less than 45°.<sup>1</sup>  
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39 F. Vertical Open: Equipment without doors and an air-curtain angle greater than or equal to 0° and  
40 less than 10° from the vertical.<sup>1</sup>  
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42 G. Ice Cream Freezer: A Commercial freezer that is designed to operate at or below -5°F (-21°C)  
43 and that the manufacturer designs, markets, or intends for the storing, displaying, or dispensing of  
44 ice cream.<sup>1</sup>  
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46 H. Solid Door Cabinet: A commercial refrigerator, freezer, or refrigerator-freezer in which all outer  
47 doors on all sides of the unit are solid doors. These doors may be sliding or hinged.

<sup>1</sup> 10 CFR §431.62

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- I. Transparent Door Cabinet: A commercial refrigerator, freezer, or refrigerator-freezer in which all outer doors on at least one side of the unit are transparent doors. These doors may be sliding or hinged.
- J. Mixed Solid/Transparent Door Cabinet: A commercial refrigerator, freezer, or refrigerator-freezer in which all outer doors on at least one side of the unit are a combination of solid and transparent doors. A unit which has all transparent doors on one side and a combination of solid and transparent doors on another is considered a transparent door cabinet.
- K. Solid Door: A door with less than 75% of the surface area is composed of a transparent material.
- L. Transparent Door: A door with greater than or equal to 75% of the surface area is composed of a transparent material.
- M. Door Angle:
  - a. For equipment with a flat door, the angle between a vertical line and the line formed by the plane of the door, when the equipment is viewed in cross-section; and
  - b. For equipment with curved doors, the angle formed between a vertical line and the straight line drawn by connecting the top and bottom points where the display area transparent joins the cabinet, when the equipment is viewed in cross-section.<sup>1</sup>
- N. Basic Model: All units of a given type of commercial refrigerator, freezer, or refrigerator-freezer (or class thereof) manufactured by one manufacturer that have the same primary energy source, which have electrical characteristics that are essentially identical, and which do not have any differing electrical, physical, or functional characteristics that affect energy consumption.<sup>1</sup>

**Note:** EPA is proposing several changes to the definitions in Section 1 to align with the DOE regulatory program. EPA is proposing to change the term “glass” to “transparent” throughout the specification to be more comprehensive in the coverage of products and type of doors available in the market.

EPA has removed the Commercial Refrigerator and Freezer requirements that the model shall be tested in “as-shipped” conditions for purposes of ENERGY STAR to align with the DOE regulatory program testing and qualifying conditions.

EPA has also adopted the DOE Commercial Refrigerator, Freezer, and Refrigerator-Freezer; Commercial Hybrid Refrigerator, Freezer, and Refrigerator-Freezer; Horizontal Closed; Horizontal Open; Vertical Closed; Vertical Open; Ice Cream Freezer; and Door Angle definitions, presented in 10 CFR §431.62. EPA has also replaced the previous Product family term with the DOE Basic Model definition, for testing representative models.

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## 2) Scope:

- A. Included Products: Products that meet the definitions of a Commercial Refrigerator, Freezer, and Refrigerator-Freezer and Horizontal Closed or Vertical Closed as specified are eligible for ENERGY STAR qualification, with the exception of products listed in Section 2.B.

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

To be eligible for this specification, solid and transparent door refrigerators and freezers shall be commercial-grade and therefore, third-party certified to the applicable requirements set forth in the following quality and safety standards:

- a. ANSI/NSF International Standard for Food Equipment – Commercial Refrigerators and Freezers (ANSI/NSF 7-2009); and

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b. UL Standard for Commercial Refrigerators and Freezers (UL-471).

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

- B. Excluded Products: Drawer cabinets, prep tables, deli cases, horizontal open air units, vertical open air units, display cases, commercial hybrid refrigerators and freezers, dual temperature units, and ice cream freezers are not eligible for ENERGY STAR. Products that are covered under other ENERGY STAR product specifications (e.g. Residential Refrigerators and Freezers) are not eligible for qualification under this specification.

**Note:** EPA is clarifying that the scope of the Commercial Refrigerators and Freezers ENERGY STAR program must meet the Commercial Refrigerator, Freezer, and Refrigerator-Freezer and the Horizontal Closed or Vertical Closed definitions presented in 10 CFR §431.62, as well as meet the scope as outlined in Section 2.A.

EPA is clarifying that some types of commercial refrigerator and freezer products (i.e., horizontal open air units, vertical open air units, display cases, commercial hybrid refrigerators and freezers, dual temperature units, and ice cream freezers) are excluded from the scope in Section 2.B, above, to better differentiate eligible and non-eligible products for ENERGY STAR qualification.

All product types included in the current Version 2.1 scope are still eligible for ENERGY STAR qualification under Version 3.0. The proposed scope of Version 3.0 has not been expanded from those covered products in Version 2.1.

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**3) Qualification Criteria:**

- A. Maximum Daily Energy Consumption Requirements:

| Table 1: ENERGY STAR Requirements for Commercial Refrigerators, Freezers, and Refrigerator-Freezers <sup>2</sup> |                                  |                                  |
|--|----------------------------------|----------------------------------|
| Product Volume (in cubic feet)   | Refrigerator                     | Freezer                          |
| <b>Vertical Closed</b>   |                                  |                                  |
| <i>Solid Door Cabinets</i>   |                                  |                                  |
| $0 < V < 15$   | VCS. SC. M<br>0.11V+0.70         | VCS.SC.L<br>0.25V+1.20           |
| $15 \leq V < 30$   | 0.05V+1.35                       | 0.29V+0.45                       |
| $30 \leq V < 50$   | 0.04V+1.64                       | 0.12V+6.10                       |
| $50 \leq V$  | 0.02V+2.95                       | 0.18V+3.20                       |
| <i>Transparent Door Cabinets</i>   |                                  |                                  |
| $0 < V < 15$   | VCT.SC.M<br>0.10V+1.07           | VCT.SC.L<br>0.61V+0.89           |
| $15 \leq V < 30$   | 0.13V+0.80                       | 0.30V+5.50                       |
| $30 \leq V < 50$   | 0.04V+3.80                       | 0.60V-4.20                       |
| $50 \leq V$  | 0.05V+3.75                       | 0.30V+11.00                      |
| <b>Horizontal Closed</b>   |                                  |                                  |
| <i>Solid or Transparent Door Cabinets</i>  |                                  |                                  |
| Any volume   | HCT.SC.M, HCS.SC.M<br>0.06V+0.60 | HCT.SC.L, HCS.SC.L<br>0.10V+0.20 |

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

**Note:** The market adapted quickly to the Version 2.0 performance levels, such that currently ENERGY STAR qualified commercial refrigerators and freezers represent approximately 65% of the units shipped in the U.S. ([www.energystar.gov/usd](http://www.energystar.gov/usd)). At this level of market penetration, it is appropriate for EPA to review and modify the ENERGY STAR eligibility criteria to ensure ENERGY STAR remains an effective differentiator in the market of highly efficient products.

The proposed maximum daily energy consumption (MDEC) levels for commercial refrigerators and freezers in Table 1, above, are based on a robust data set obtained from the current ENERGY STAR Qualified Products List (QPL) and augmented by data from the California Energy Commission's (CEC) database.

Stakeholders have provided comments to EPA that newer, more efficient technologies and designs are becoming more prevalent in the market and EPA anticipates this trend to continue in the upcoming years. EPA is proposing more stringent performance criteria levels than the current Version 2.1 levels, except for vertical, transparent freezer units less than 15 cubic feet, to highlight the top energy efficient products in the current market.

During the November 15, 2012 ENERGY STAR Commercial Refrigerators and Freezers Version 3.0 launch webinar, EPA initiated discussions regarding the prevalence of natural refrigerants in the U.S. marketplace and the impacts they have on energy performance. It was noted that they currently have a small presence in the market compared with conventional refrigerants. However, industry experts anticipate that within 5 years, natural refrigerants will have a significant influence on the U.S. market.

There is a diverse set of opinions regarding the relative impact on the units energy performance associated with natural refrigerants. EPA understands that Global Warming Potential (GWP) values for many alternative refrigerants are considerably less than those fluorocarbon-based refrigerants and continues to be interested in reviewing information on natural refrigerants. Also, a few stakeholders noted that alternative components and designs are needed for these alternative refrigeration systems to safely and effectively operate with natural refrigerants, adding to the cost of the equipment.

At this time, EPA does not see a need to create a separate classification for purposes of qualification as proposed in the framework document. For Version 3.0, EPA is proposing to continue to maintain separate levels for commercial refrigerators and freezers based solely on configuration, application, size, and door type (with the exception of horizontal closed cabinets) and not include refrigerant type as a differentiating factor.

EPA requests stakeholder feedback on the exemption of natural refrigerant consideration for determining performance levels.

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

**Note:** EPA has revised Section 3.B, above, to cite the DOE test procedure 10 CFR §431.64 that specifies how to measure and calculate the refrigerated volume of commercial refrigerators and freezers.

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- C. Determining Maximum Daily Energy Consumption for Mixed Solid/Transparent Door Cabinets: This section applies to mixed solid/transparent door cabinets designed with two or more compartments contained in a single cabinet with different exterior door types (i.e., one is solid and one is transparent) on the same side of the cabinet. The maximum daily energy consumption (MDEC) of mixed solid/ transparent door cabinets shall be the sum of all individual compartment MDEC values. For purposes of mixed solid/ transparent door cabinets, compartments are defined by the refrigerated volume associated with the different exterior door types. The interior of these compartments may or may not be physically separated.

The refrigerated volume of each individual compartment shall be measured, and its MDEC limit determined, based on the compartment's volume and door type, as listed in Table 1 above. The sum of the volumes of each compartment shall be equivalent to the total volume of the cabinet.

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

Transparent Door MDEC:  $(25 \text{ cu. ft.} \times 0.13) + 0.80 = 4.05 \text{ kWh/day}$

Solid Door MDEC:  $(25 \text{ cu. ft.} \times 0.05) + 1.35 = 2.60 \text{ kWh/day}$

MDEC for entire cabinet:  $4.05 \text{ kWh/day} + 2.60 \text{ kWh/day} = 6.65 \text{ kWh/day}$

C. Significant Digits and Rounding:

a. All calculations shall be carried out with directly measured (unrounded) values. Final ratings for daily energy consumption should be rounded to 0.01 kWh increments in accordance with the DOE test procedure provisions.

b. Directly measured or calculated values that are submitted for reporting on the ENERGY STAR website shall be calculated in accordance with the requirements for determining certified ratings for DOE.

4) **Test Requirements:**

A. One of the following sampling plans shall be used to test energy performance for qualification to ENERGY STAR:

a. A single unit is selected, obtained, and tested. The measured performance of this unit and of each subsequent unit manufactured must be equal to or better than the ENERGY STAR specification requirements. Results of the tested unit may be used to qualify additional individual model variations within a basic model as long as the definition for basic model provided in Section 1, above, is met; or

b. Units are selected for testing and results calculated according to the sampling requirements defined in 10 CFR Part 429, Subpart B §§ 429.11 and 429.42. The certified rating must be equal to or better than the ENERGY STAR specification requirements. Results of the tested unit may be used to qualify additional model variations within a basic model as long as the additional model variations meet the definition for basic model provided in Section 1.N, above. Further, all individual models within a basic model must have the same certified rating per DOE's regulations in Part 429 and this rating must be used for all manufacturer literature, the qualified product list, and certification of compliance to DOE energy conservation standards.

B. When testing commercial refrigerators and freezers, the following test methods shall be used to determine ENERGY STAR qualification:

**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) |

**Note:** For purposes of testing, representative models must meet the Basic Model definition provided in Section 1. N, above. EPA has also revised the test method referenced in Table 2 to align with the DOE test procedures.

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

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**Note:** The DOE test procedure provides the temperature specifications for testing and thus EPA has removed section 4.C of the current Version 2.1 specification.

To harmonize with the regulatory program, EPA has eliminated Sections 4.D and 4.E of the Version 2.1 specification. These sections included additional testing condition guidance, requiring manually controlled standard accessories (e.g., lighting, perimeter heaters, and pan heaters) to remain in the “On” position during testing, and that power management devices that will never change the integrated average temperature during the test period and are permanently installed, such that the operator is not able to adjust the settings, may remain operational during testing.

For the purpose of ENERGY STAR, all eligible commercial refrigerators and freezers with standard accessories and power management devices shall undergo testing as specified in § 431.64.

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**5) Effective Date:** The ENERGY STAR Commercial Refrigerator and Freezer Version 3.0 specification shall take effect on **TBD**. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on the model’s date of manufacture. The date of manufacture is specific to each unit and is the date on which a unit is considered to be completely assembled.

**Note:** Following the Draft 1 comment period, EPA will hold an ENERGY STAR stakeholder meeting during the National Restaurant Association (NRA) Show on May 20, 2013. EPA plans to then release a Draft 2 specification shortly thereafter. EPA anticipates finalizing this specification by the end of 2013.

Once finalized, manufacturers may immediately begin submitting products for third party certification under the new Version 3.0, which will become effective approximately nine months later.

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