§ 431.63 Materials incorporated by reference.

(a) General. We incorporate by reference the following standards into subpart C of part 431. The material listed has been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR 51. Any subsequent amendment to a standard by the standard-setting organization will not affect the DOE regulations unless and until amended by DOE. Material is incorporated as it exists on the date of the approval and a notice of any change in the material will be published in the Federal Register. All approved material is available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030 or go to http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html. Also, this material is available for inspection at U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, 6th Floor, 950 L’Enfant Plaza, SW, Washington, DC 20024, 202–586–2945, or go to http://www1.eere.energy.gov/appliance/standards.

(b) ANSI. American National Standards Institute, 25 W. 43rd Street, 4th Floor, New York, NY 10036, 212–642–4900, or go to http://www.ansi.org:


§ 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. Manufacturers shall use this paragraph (b) for the purposes of certifying compliance with the applicable energy conservation standards and for all representations of energy efficiency/energy use. For equipment manufactured prior to January 1, 2016, determine the daily energy consumption of each covered commercial refrigerator, freezer, or refrigerator-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,

(1) For display cases manufactured after January 1, 2016 and sold with night curtains installed, the night curtain shall be employed for 6 hours; 3 hours after the start of the first defrost period. Upon the completion of the 6-hour period, the night curtain shall be raised until the completion of the 24-hour test period.

(2) For commercial refrigerators, freezers, and refrigerator-freezers manufactured after January 1, 2016 and sold with lighting occupancy sensors, scheduled lighting controls, or lighting occupancy sensors and scheduled lighting controls installed on the unit, the effect on daily energy consumption will be determined by either a physical test or a calculation method and using the variables that are defined as:

- $\text{CEC}_A$ is the Alternate Compressor Energy Consumption (kilowatt-hours);
- $\text{LEC}_{sc}$ is the lighting energy consumption of internal case lights with lighting occupancy sensors and controls deployed (kilowatt-hours);
- $P_a$ is the rated power of lights when they are fully on (watts);
- $P_{\text{off}}$ is the power of lights when they are off (watts);
- $P_{\text{dim}}$ is the power of lights when they are dimmed (watts);
- $\text{TDEC}_{o}$ is the total daily energy consumption with lights fully on, as measured by AHRI Standard 1200 (I-P)-2010 (kilowatt-hours);
- $t_{\text{dim}}$ is the time period which the lights are dimmed due to the use of lighting occupancy sensors or scheduled lighting controls (hours);
- $t_{\text{dim,sensors}}$ is the time case lighting is dimmed due to the use of lighting occupancy sensors (hours);
- $t_{\text{dim,controls}}$ is the time case lighting is dimmed due to the use of scheduled lighting controls (hours);
- $t_{\text{off}}$ is the time period when lights would be off due to the use of lighting occupancy sensors and/or scheduled lighting controls (24 hours);
- $t_{\text{off,sensors}}$ is the time case lighting is off due to the use of lighting occupancy sensors (hours);
- $t_{\text{off,controls}}$ is the time case lighting is off due to the use of scheduled lighting controls (hours);
- $t_{\text{t}}$ is the time period when lights would be on without lighting occupancy sensors and/or scheduled lighting controls.

(i) For both a physical test and a calculation method, determine the estimated time off or dimmed, $t_{\text{off}}$ or $t_{\text{dim}}$, as the sum of contributions from lighting occupancy sensors and scheduled lighting controls which dim or turn off lighting, respectively, as shown in the following equation:

$$t_{\text{dim}} = t_{\text{dim,sensors}} + t_{\text{dim,controls}}$$

$$t_{\text{off}} = t_{\text{off,sensors}} + t_{\text{off,controls}}$$

The sum of $t_{\text{off}}$, $t_{\text{off}}$, and $t_{\text{dim}}$ should equal 24 hours and the total time period during which the lights are off or dimmed shall not exceed 10.8 hours. For cases with scheduled lighting controls, the time the case lighting is off and/or dimmed due to scheduled lighting controls (off or dimmed, $t_{\text{off}}$ or $t_{\text{dim}}$, as the sum of contributions from lighting occupancy sensors and scheduled lighting controls which dim or turn off lighting, respectively, as shown in the following equation:
due to lighting occupancy sensors \((t\text{off, sensors} \text{ or } t\text{dim, sensors})\), as applicable) shall not exceed 10.8 hours. For cases with lighting occupancy sensors and scheduled lighting controls installed, the time the case lighting is off and/or dimmed due to lighting occupancy sensors \((t\text{off, controls} \text{ or } t\text{dim, controls})\), as applicable) shall not exceed 8 hours.

(ii) If using a physical test to determine the daily energy consumption of a commercial refrigerator, freezer, or refrigerator-freezer sold with lighting occupancy sensors, scheduled lighting controls, or lighting occupancy sensors and scheduled lighting controls installed on the unit—

(A) Calculate the LEC\(_{sc}\) using the following equation:

\[
LEC_{sc} = \frac{(P_{li} \times t_{sc}) + (P_{li(\text{off})} \times t_{\text{off}}) + (P_{li(\text{dim})} \times t_{\text{dim}})}{(1000)}
\]

(B) Calculate the CEC\(_{A}\) using the following equation:

\[
CEC_{A} = 0.75 \times \frac{3.4121 \times (LEC_{sc} - P_{li} \times t_{l}/1000)}{EER}
\]

Where EER represents the energy efficiency ratio from Table 1 in AHRI Standard 1200 (I-P)-2010 (incorporated by reference, see §431.63) for remote condensing equipment or the values shown in the following table for self-contained equipment:

### EER for Self-Contained Commercial Refrigerated Display Merchandisers and Storage Cabinets

<table>
<thead>
<tr>
<th>Operating temperature class</th>
<th>EER Btu/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td>11</td>
</tr>
<tr>
<td>Low</td>
<td>7</td>
</tr>
<tr>
<td>Ice Cream</td>
<td>5</td>
</tr>
</tbody>
</table>

(C) For remote condensing commercial refrigerators, freezers, and refrigerator-freezers with lighting occupancy sensors, scheduled lighting controls, or lighting occupancy sensors and scheduled lighting controls installed, the revised compressor energy consumption \((CEC_{A})\) shall be the CEC\(_{A}\) added to the compressor energy consumption \((CEC)\) measured in AHRI Standard 1200 (I-P)-

2010 (incorporated by reference, see §431.63). The CDEC for the entire case shall be the sum of the CEC\(_{A}\) and LEC\(_{sc}\) (as calculated above) and the fan energy consumption (FEC), anti-condensate energy consumption (AEC), defrost energy consumption (DEC), and condensate evaporator pan energy consumption (PEC) (as measured in AHRI Standard 1200 (I-P)-2010).

(D) For self-contained commercial refrigerators, freezers, and refrigerator-freezers with lighting occupancy sensors, scheduled lighting controls, or lighting occupancy sensors and scheduled lighting controls installed, the TDEC for the entire case shall be the sum of total daily energy consumption as measured by the AHRI Standard 1200 (I-P)-2010 (incorporated by reference, see §431.63) test with the lights fully on \((TDEC_{o})\) and CEC\(_{A}\), less the decrease in lighting energy use due to lighting occupancy sensors and scheduled lighting controls installed on the unit, turn off the lights for a time period equivalent to \(t_{\text{off}}\) and dim the lights for a time period equivalent to \(t_{\text{dim}}\). If night curtains are also being tested on the case, the period of lights off and/or dimmed shall begin at the same time that the night curtain is being deployed and shall continue consecutively, in that order, for the appropriate number of hours.

(iii) If using a calculation method to determine the daily energy consumption of a commercial refrigerator, freezer, or refrigerator-freezer sold with lighting occupancy sensors, scheduled lighting controls, or lighting occupancy sensors and scheduled lighting controls installed on the unit—

(A) Calculate the LEC\(_{sc}\) using the following equation:

\[
LEC_{sc} = \frac{(P_{li} \times t_{sc}) + (P_{li(\text{off})} \times t_{\text{off}}) + (P_{li(\text{dim})} \times t_{\text{dim}})}{(1000)}
\]

(B) Calculate the CEC\(_{A}\) using the following equation:

\[
CEC_{A} = 0.75 \times \frac{3.4121 \times (LEC_{sc} - P_{li} \times t_{l}/1000)}{EER}
\]

Where EER represents the energy efficiency ratio from Table 1 in AHRI Standard 1200 (I-P)-2010 (incorporated by reference, see §431.63). The CDEC for the entire case shall be the sum of the CEC\(_{A}\) and LEC\(_{sc}\) (as calculated above) and the fan energy consumption (FEC), anti-condensate energy consumption (AEC), defrost energy consumption (DEC), and condensate evaporator pan energy consumption (PEC) (as measured in AHRI Standard 1200 (I-P)-2010).

(D) For self-contained commercial refrigerators, freezers, and refrigerator-freezers with lighting occupancy sensors, scheduled lighting controls, or lighting occupancy sensors and scheduled lighting controls installed, the TDEC for the entire case shall be the sum of total daily energy consumption as measured by the AHRI Standard 1200 (I-P)-2010 (incorporated by reference, see §431.63) test with the lights fully on \((TDEC_{o})\) and CEC\(_{A}\), less the decrease in lighting energy use due to lighting occupancy sensors and scheduled lighting controls installed on the unit, turn off the lights for a time period equivalent to \(t_{\text{off}}\) and dim the lights for a time period equivalent to \(t_{\text{dim}}\). If night curtains are also being tested on the case, the period of lights off and/or dimmed shall begin at the same time that the night curtain is being deployed and shall continue consecutively, in that order, for the appropriate number of hours.
controls, as shown in following equation.

\[ T_{DEC} = T_{DECO} + CECA - \left( \frac{L(P_{Li} \times t_i)}{1000} - LEC_{st} \right) \]

(3) Conduct the testing required in paragraphs (b) introductory text, (b)(1), and (2) of this section, and determine the daily energy consumption, at the applicable integrated average temperature in the following table. The integrated average temperature is determined using the required test method.

<table>
<thead>
<tr>
<th>Category</th>
<th>Test procedure prior to January 1, 2016</th>
<th>Test procedure on or after January 1, 2016</th>
<th>Integrated average temperatures</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Refrigerator with Solid Door(s)</td>
<td>ARI Standard 1200-2006</td>
<td>AHRI Standard 1200 (I-P)-2010</td>
<td>38 °F (±2 °F).</td>
</tr>
<tr>
<td>(ii) Refrigerator with Transparent Door(s)</td>
<td>ARI Standard 1200-2006</td>
<td>AHRI Standard 1200 (I-P)-2010</td>
<td>38 °F (±2 °F).</td>
</tr>
<tr>
<td>(iii) Freezer with Solid Door(s)</td>
<td>ARI Standard 1200-2006</td>
<td>AHRI Standard 1200 (I-P)-2010</td>
<td>0 °F (±2 °F).</td>
</tr>
<tr>
<td>(iv) Freezer with Transparent Door(s)</td>
<td>ARI Standard 1200-2006</td>
<td>AHRI Standard 1200 (I-P)-2010</td>
<td>0 °F (±2 °F).</td>
</tr>
<tr>
<td>(v) Refrigerator-Freezer with Solid Door(s)</td>
<td>ARI Standard 1200-2006</td>
<td>AHRI Standard 1200 (I-P)-2010</td>
<td>38 °F (±2 °F) for refrigerator compartment.</td>
</tr>
</tbody>
</table>

(A) If a piece of commercial refrigeration equipment is not able to be tested at the specified integrated average temperatures of 38 °F (±2 °F), 0 °F (±2 °F), or −15 °F (±2 °F) for refrigerators, freezers, and ice-cream freezers, respectively, the unit may be tested at the lowest application product temperature, as defined in § 431.62. For many pieces of equipment, this will be the lowest thermostat setting. For remote condensing equipment without a thermostat or other means of controlling temperature at the case, the lowest application product temperature shall be that achieved with the adjusted dew point temperature (as defined in AHRI 1200 (I-P)-2010) set to 5 degrees colder than that required to maintain the manufacturer’s lowest specified application temperature.

(B) For commercial refrigeration equipment that is also tested in accordance with NSF test procedures (Type I and Type II), integrated average temperatures and ambient conditions used for NSF testing may be used in place of DOE prescribed integrated average temperatures and ambient conditions provided they result in a more stringent test. That is, the measured daily energy consumption of the unit when tested with the rating temperatures or ambient conditions specified in the DOE test procedure, will be lower than or equal to the measured daily energy consumption of the unit when tested with the rating temperatures or ambient conditions.
used for NSF testing. The integrated average temperature measured during the test may be lower than the range specified by the DOE rating temperature specifications, provided in paragraph (b)(3) of this section, but may not exceed the upper value of the specified range. Ambient temperatures and/or humidity values may be higher than those specified in the DOE test procedure.


ENERGY CONSERVATION STANDARDS

§431.66 Energy conservation standards and their effective dates.

(a) In this section—

(1) The term “AV” means the adjusted volume \( (ft^3) \) (defined as \( 1.63 \times \) frozen temperature compartment volume \( (ft^3) \) + chilled temperature compartment volume \( (ft^3) \) ) with compartment volumes measured in accordance with the Association of Home Appliance Manufacturers Standard HRF–1–1979.

(2) The term “V” means the chilled or frozen compartment volume \( (ft^3) \) (as defined in the Association of Home Appliance Manufacturers Standard HRF–1–1979).

(3) Except as to service over the counter, self-contained, medium temperature commercial refrigerators manufactured on or after January 1, 2012, the term “TDA” means the total display area \( (ft^2) \) of the case, as defined in the AHRI Standard 1200–2006, appendix D (incorporated by reference, see §431.63).

(b)(1) Except for service over the counter, self-contained, medium temperature commercial refrigerators manufactured on or after January 1, 2012, 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, shall have a daily energy consumption (in kilowatt hours per day) that does not exceed the following:

<table>
<thead>
<tr>
<th>Category</th>
<th>Maximum daily energy consumption (kilowatt hours per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerators with solid doors</td>
<td>0.10V + 2.04.</td>
</tr>
<tr>
<td>Refrigerators with transparent doors</td>
<td>0.12V + 3.34.</td>
</tr>
<tr>
<td>Freezers with solid doors</td>
<td>0.40V + 3.38.</td>
</tr>
<tr>
<td>Freezers with transparent doors</td>
<td>0.75V + 4.10.</td>
</tr>
<tr>
<td>Refrigerator/freezers with solid doors</td>
<td>the greater of 0.27AV–0.71 or 0.70.</td>
</tr>
</tbody>
</table>

(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 \( 0.6 \times \) TDA + 1.0.

As used in the preceding sentence, “TDA” means the total display area \( (ft^2) \) 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, 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