ANSI/AHRI Standard 1201-2023 (SI)

2023 Standard for

Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

Approved by ANSI on 27 November 2023

AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE
we make life better®
2311 Wilson Boulevard, Suite 400
Arlington, VA 22201, USA
www.ahrinet.org
PH 703.524.8800
FX 703.562.1942

Documents
Document Sharing Hub
Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

©Copyright 2023, by Air-Conditioning, Heating, and Refrigeration Institute
Registered United States Patent and Trademark Office
Printed in USA

IMPORTANT

SAFETY DISCLAIMER

AHRI does not set safety standards and does not certify or guarantee the safety of any products, components or systems designed, tested, rated, installed, or operated in accordance with this standard/guideline. It is strongly recommended that products be designed, constructed, assembled, installed, and operated in accordance with nationally recognized safety standards and code requirements appropriate for products covered by this standard/guideline.

AHRI uses its best efforts to develop standards/guidelines employing state-of-the-art and accepted industry practices. AHRI does not certify or guarantee that any tests conducted under its standards/guidelines will be non-hazardous or free from risk.

ICS Code: 97.130.20

Note:

This standard supersedes ANSI/AHRI Standard 1201-2013 (SI).

For I-P ratings, see ANSI/AHRI Standard 1200-2023 (I-P).

AHRI Certification Program Disclaimer

AHRI Standards are developed independently of AHRI Certification activities and can have scopes that include products that are not part of the AHRI Certification Program. The scope of the applicable AHRI Certification Program can be found on the AHRI website at www.ahrinet.org.

Documents
Document Sharing Hub

Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

Intent

This standard is intended for the guidance of the industry, including manufacturers, engineers, installers, contractors and users. The values reported using this standard allow comparison of energy consumption within each of the following product categories: Remote Commercial Refrigerated Display Merchandisers, Remote Commercial Refrigerated Storage Cabinets, Self-contained Commercial Refrigerated Display Merchandisers and Self-contained Commercial Refrigerated Storage Cabinets.

Review and Amendment

This standard is subject to review and amendment as technology advances.

2023 Edition

This edition of AHRI Standard 1201-2023 (SI), *Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets*, was prepared by the Commercial Refrigeration Standards Technical Committee. It was approved by the Refrigeration Standards Subcommittee on 16 October 2023. It was approved as an American National Standard (ANS) on 27 November 2023.

Origin and Development of AHRI Standard 1201

In 2002 the Commercial Refrigerator Manufacturers Division of ARI identified the need for a commercial refrigeration standard to assure that perishable foods stored, displayed, and dispensed in retail stores throughout the world for off-premises consumption are protected throughout the final stage in the distribution process. The first edition was developed providing a method whereby electrical energy consumption values of commercial refrigerators and freezers are determined using consistent and repeatable methods.

In 2004 ARI 1200 was harmonized with EN 441. Appendix D was added to provide TDA calculations. Section 3, Section 5.4, Table 3, and Table 4 were revised to include references to TDA calculations.

In 2006 changes were made to Section 5 and Appendix E to address energy differences for ballasts inside and outside the refrigerated area.

In 2008 the rating requirements were updated with a secondary method.

In 2010 the Commercial Refrigerator Manufacturers Section (CRM) made changes to Section 2.2 and Section 3.14. Appendix C was added to have consistency with DOE rule.

In 2013 changes were made to incorporate five interpretations and new DOE rules.

AHRI Standard 1201-2023 (SI) contains the following updates to the previous edition:

- TDA figures and equations were updated for alignment with DOE TP and Standard.
- The Coefficient of Performance (COP) table was updated for refrigerant dependability and glide concerns.
- Refrigerant glide was updated in Section 4 and Section 5 including definition and rating requirement sections.
- Definitions updated to include Ice cream applications and edits to existing definitions.
- Added lighting options and updates to ASHRAE 72.
- Definition section updated to include lighting, and sensors to align with DOE TP requirements.
- Added various product types.
- Consideration of non-standard operating temperatures.

Documents
Document Sharing Hub
Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

Committee Personnel

Commercial Refrigeration Standards Technical Committee

Participant	Interest Category Classification	Voting Member Role	State / Country
Homer Redd Hillphoenix	Manufacturer	Chair	VA, USA
Tim Anderson Hussmann Corporation	Manufacturer	Primary	MO, USA
Jeff Bauman Continental Refrigerator	Manufacturer	Primary	PA, USA
Mike Chieffo Zero Zone, Inc	Manufacturer	Primary	WI, USA
Chris Jentzsch Heatcraft Worldwide Refrigeration LLC	Manufacturer	Primary	GA, USA
Jon Murray Structural Concepts Corporation	Manufacturer	Primary	MI, USA
Massoud Neshan Arneg USA	Manufacturer	Primary	NC, USA
Roxanne Scott Emerson Commercial and Residential Solutions	Manufacturer	Primary	OH, USA
Ronald Shughart Heat Transfer Products Group, LLC (HTPG)	Manufacturer	Primary	GA, USA
Brian Austin Heatcraft Worldwide Refrigeration LLC	Manufacturer	Alternate to Chris Jentzsch	GA, USA
Bruce Hierlmeier Zero Zone, Inc	Manufacturer	Alternate to Mike Chieffo	WI, USA
Scott Martin Hillphoenix	Manufacturer	Alternate to Homer Redd	GA, USA
Wilson Mwaura Hussmann Corporation	Manufacturer	Alternate to Tim Anderson	MO, USA
Wayne Schaeffer Hussmann Corporation	Manufacturer	Alternate to Tim Anderson	MO, USA
Ron Shebik Hussmann Corporation	Manufacturer	Alternate to Tim Anderson	MO, USA
Greg Kalinyak	AHRI Staff Liaison		

Commercial Refrigeration Standards Technical Committee Scope:

The Commercial Refrigeration Standards Technical Committee (STC) is responsible for the development and maintenance of AHRI standards and guidelines pertaining to the performance ratings of Commercial Refrigerated Equipment that may include Display Merchandisers and Storage Cabinets, Walk-in Coolers and Freezers including insulated envelop and systems.

Documents
Document Sharing Hub
Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

Refrigeration Standards Subcommittee

Participant	Interest Category Classification	Voting Member Role	State or Province / Country
Mike Straub Heat Transfer Products Group, LLC (HTPG)	Manufacturer	Chair	AL, USA
Kunal Bansal Heatcraft Worldwide Refrigeration LLC	Manufacturer	Primary	GA, USA
Steve Combs Everidge	Manufacturer	Primary	VA, USA
Daryl Erbs Welbilt, Inc.	Manufacturer	Primary	FL, USA
Bruce Hierlmeier Zero Zone, Inc	Manufacturer	Primary	WI, USA
Jennifer Kane Trane Technologies	Manufacturer	Primary	MO, USA
Scott Martin Hillphoenix	Manufacturer	Primary	GA, USA
Ron Shebik Hussmann Corporation	Manufacturer	Primary	MO, USA
Vince Zolli KeepRite Refrigeration	Manufacturer	Primary	ON, Canada
Karl Best	AHRI Staff Liaison		

Refrigeration Standards Subcommittee Scope:

Scope of the Refrigeration Standards Subcommittee is standards and guidelines related to the end products that are part of the AHRI Refrigeration Industry Sector.

These committee lists represent the membership at the time the Standards Working Group, Standards Technical Committee, and Standards Subcommittee were balloted on the final text of this edition. Since that time, changes in the membership may have occurred. Membership on these committees shall not in and of itself constitute an endorsement by the committee members or their employers of any document developed by the committee on which the member serves.

Documents
Document Sharing Hub
Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

Refrigeration Consensus Body

Participant	Interest Category Classification	Voting Member Role
Mike Devine Tecumseh Products Company	Component Manufacturer	Primary
Philip Cantin mmic Medical Systems	Consumer/User	Primary
Jim Kendzel American Supply Association	General Interest	Primary
Arunkumar Elango Heatcraft Worldwide Refrigeration LLC	Product Manufacturer	Primary
Charles Plourde-LeBlanc Nortek Air Solutions, LLC	Product Manufacturer	Primary
Paul Lindahl SPX Cooling Technologies, Inc.	Product Manufacturer	Primary
Jennifer Kane Trane Technologies	Product Manufacturer	Primary
W. Vance Payne National Institute of Standards & Technology	Testing Laboratory	Primary

Documents
Document Sharing Hub
Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

TABLE OF CONTENTS

Page

SECTIONS

Section 1. Purpose 1
Section 2. Scope 1
Section 3. Definitions 1
Section 4. Test Requirements 4
Section 5. Rating Requirements 5
Section 6. Minimum Data Requirements for Published Ratings 8
Section 7. Marking and Nameplate Data 10
Section 8. Conformance Conditions 10
Section 9. Symbols and Subscripts 10

FIGURES

Figure 1. Sample Front View of Commercial Refrigerated Display Merchandisers for Illustrating Length of Refrigerated Space 16
Figure 2. Sample Cross Section of Commercial Refrigerated Storage Cabinets for Refrigerated Volume Calculation 16
Figure 3. Three-door Vertical Closed Transparent Display Case 17
Figure 4. Vertical Open Multi-deck 19
Figure 5. Vertical Open Multi-deck with Transparent Front 19
Figure 6. Semi-vertical Open Multi-deck with Smaller Product Zone 20
Figure 7. Semi-vertical Open Multi-deck with Transparent Front 20
Figure 8. Horizontal Open Single-deck 21
Figure 9. Horizontal Open Single-deck with Transparent Front 21
Figure 10. SOC with Flat Transparent Front 22
Figure 11. SOC with Curved Transparent Front 22
Figure 12. SOC with Flat Transparent Front and Top 23
Figure 13. Horizontal Open Single-deck Island 23
Figure 14. Horizontal Open Single-deck Island with Transparent Wall 24
Figure 15. Island with Transparent Walls 24
Figure 16. Vertical Closed Multi-deck with Transparent Doors 25
Figure 17. Vertical End Wall with Transparent Section 26
Figure 18. Semi-vertical End Wall with Transparent Section 27
Figure 19. Horizontal Single-deck and Single-deck Island End Wall with Transparent Section 27
Figure 20. SOC End Wall with Transparent Section 28
Figure 21. Example TDA for Unique Geometries 28
Figure 22. Example TDA for Unique Geometries 29
Figure 23. Example TDA for Unique Geometries 29
Figure 24. Radius Cases with Transparent Sides 30
Figure 25. Mitered Wedge TDA Calculation 31
Figure 26. Curved Wedge TDA Calculation 32

Documents
Document Sharing Hub

Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

TABLES

Table 1 COP for Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets 7
Table 2 Example Presentation of Data for Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets (Informative) 9
Table 3 Example Presentation of Data for Self-contained Commercial Refrigerated Display Merchandisers and Storage Cabinets (Informative) 10

APPENDICES

Appendix A. References – Normative 13
Appendix B. References – Informative 14
Appendix C. Commercial Refrigerated Display Merchandiser and Storage Cabinet Refrigerated Volume Calculation – Normative 15
Appendix D. Commercial Refrigerated Display Merchandiser and Storage Cabinet Total Display Area (TDA) Calculation – Normative 17
Appendix E. Example – Calculation of CEC for Commercial Refrigerated Display Merchandiser or Storage Cabinet Tested with a High-glide Refrigerant – Informative 33
Appendix F. Energy Calculations Using Alternate Components – Informative 34

Documents
Document Sharing Hub
Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

PERFORMANCE RATING OF COMMERCIAL REFRIGERATED DISPLAY MERCHANDISERS AND STORAGE CABINETS

Section 1. Purpose

1.1 *Purpose*

The purpose of this standard is to establish for Commercial Refrigerated Display Merchandisers and Storage Cabinets: definitions; test requirements; rating requirements; symbols and subscripts; minimum data requirements for Published Ratings; marking and nameplate data and conformance conditions.

Section 2. Scope

2.1 *Scope*

This standard applies to the following manufacturers' standard catalog Commercial Refrigerated Display Merchandisers and Storage Cabinets, provided that the cases are equipped and designed to work with electrically driven, direct expansion type systems or thermoelectric systems:

- Self-contained and Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets; and
- Open and Closed Commercial Refrigerated Display Merchandisers

2.2 *Exclusions*

This standard does not apply to the following:

- Refrigerated vending machines
- Ice makers
- Soft serve extruders
- Secondary coolant applications
- Chef bases
- Buffet tables
- Preparation tables
- Walk-in coolers
- Blast chillers and freezers

Section 3. Definitions

All terms in this document will follow the standard industry definitions in the ASHRAE Terminology website unless otherwise defined in this section.

3.1 *Expressions of Provision*

Terms that provide clear distinctions between requirements, recommendations, permissions, options, and capabilities.

3.1.1 *"Can" or "cannot"*

Express an option or capability.

3.1.2 *"May"*

Signifies a permission expressed by the document.

3.1.3 *"Must"*

Indication of unavoidable situations and does not mean that an external constraint referred to is a requirement of the document.

3.1.4 *"Shall" or "shall not"*

Indication of mandatory requirements to strictly conform to the standard and where deviation is not permitted.

Documents
Document Sharing Hub
Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

3.1.5 *"Should" or "should not"*

Indication of recommendations rather than requirements. In the negative form, a recommendation is the expression of potential choices or courses of action that is not preferred but not prohibited.

3.2 *Standard Specific Definitions:*

3.2.1 *Anti-condensate Energy Consumption (AEC)*

The energy consumed to prevent collection of or evaporate condensate, or both on the outside of the Commercial Refrigerated Display Merchandiser or Storage Cabinet, that includes fan and condensate heater energy expressed in kW·h per day.

3.2.2 *Calculated Daily Energy Consumption (CDEC)*

A value for Remote Commercial Refrigerated Display Merchandisers or Storage Cabinets based upon the requirements of this standard expressed in kW·h per day.

3.2.3 *Commercial Refrigerated Display Merchandiser*

A cabinet cooled by a refrigerating system for displaying chilled or frozen products, or both, maintained within prescribed temperature limits.

3.2.3.1 *Closed Commercial Refrigerated Display Merchandiser*

A refrigerated display merchandiser where product is accessible for removal by opening or moving doors, drawers, or panels.

3.2.3.2 *Open Commercial Refrigerated Display Merchandiser*

A refrigerated display merchandiser where product is accessible for removal without opening or moving doors, drawers, or panels.

3.2.3.3 *Remote Commercial Refrigerated Display Merchandiser*

A refrigerated display merchandiser that is refrigerated by a field-installed condensing unit or refrigerating system.

3.2.3.4 *Self-contained Commercial Refrigerated Display Merchandiser*

A refrigerated display merchandiser that has all the refrigerant-containing parts of the refrigerating system completely factory assembled and tested.

3.2.3.5 *Service Over Counter (SOC)*

A commercial refrigerated display merchandiser equipped with sliding or hinged doors, drawers, or open in the back, intended for use by sales personnel, and with glass or other transparent material in the front for displaying merchandise. The equipment has a height not greater than sixty-six inches and is intended to serve as a counter for transactions between sales personnel and customers.

3.2.4 *Commercial Refrigerated Storage Cabinet*

A closed cabinet cooled by a refrigerating system for storing chilled or frozen product, or both maintained within prescribed temperature limits.

3.2.4.1 *Remote Commercial Refrigerated Storage Cabinet*

A refrigerated storage cabinet that is refrigerated by a field-installed condensing unit or refrigerating system.

3.2.4.2 *Self-contained Commercial Refrigerated Storage Cabinet*

A refrigerated storage cabinet that has all the refrigerant-containing parts of the refrigerating system completely factory assembled and tested.

3.2.5 *Compressor Energy Consumption (CEC)*

The energy consumed by the compressor expressed in kW·h per day.

Documents
Document Sharing Hub
Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

3.2.6 *Condensate Evaporator Pan Heater Energy Consumption (PEC)*

The energy consumed by the condensate evaporator pan heater expressed in kW·h per day.

3.2.7 *Defrost Energy Consumption (DEC)*

The energy consumed by the defrost heater(s) expressed in kW·h per day.

3.2.8 *Dew Point*

Refrigerant vapor saturation temperature at a specified pressure expressed in °C.

3.2.8.1 *Adjusted Dew Point*

An adjusted temperature lower than actual Dew Point temperature expressed in °C, resulting from suction line pressure losses, equal to saturated suction temperature at the compressor.

3.2.9 *Coefficient of Performance (COP)*

A ratio of the cooling capacity in watts W to the power input values in watts at any given set of Rating Conditions expressed in W/W.

3.2.10 *Fan Energy Consumption (FEC)*

The energy consumed by fan motors expressed in kW·h per day.

3.2.11 *High Glide Refrigerant*

A zeotropic refrigerant blend with a temperature glide that is greater than 1 K. Examples include but are not limited to R-407A, R-407C, R-407F, R-448A, and R-449A.

3.2.12 *Integrated Average Temperature*

The average of all test package measurements taken during the test expressed in °C.

3.2.13 *Lighting Energy Consumption (LEC)*

The energy consumed by the refrigerated display merchandiser or storage cabinet lighting used to illuminate interior refrigerated products expressed in kW·h per day.

3.2.14 *Product Applications*

One of four temperature ranges that a Commercial Refrigerated Display Merchandiser or Storage Cabinet is intended to maintain.

3.2.14.1 *High Temperature Applications*

An application where the Integrated Average Temperature is at, or above, 7°C.

3.2.14.2 *Ice Cream Applications*

An application where the Integrated Average Temperature is at, or below, -20°C, and intended for the display, storage, or dispensing of ice cream.

3.2.14.3 *Low Temperature Applications*

An application where the Integrated Average Temperature is at, or below, 0°C, and greater than -20°C.

3.2.14.4 *Medium Temperature Applications*

An application where the Integrated Average Temperature is greater than 0°C, and less than 7°C.

3.2.14.5 *Lowest Application Product Temperature (LAPT)*

For remote condensing equipment that is not capable of operating a successful test at a Standard Rating Condition, the LAPT is the temperature achieved with the Dew Point temperature set to the manufacturer's recommended setpoint. For self-contained equipment that is not capable of operating a successful test at a Standard Rating Condition, the LAPT is the temperature achieved at the lowest thermostat setting.

Documents
Document Sharing Hub
Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

3.2.15 *Published Rating*

A statement of the assigned values of those performance characteristics, under stated Rating Conditions, where a unit can be chosen to fit the application. These values apply to all units of the same nominal size and type (identification) produced by the same manufacturer. This includes the rating of all performance characteristics shown on the unit or published in specifications, advertising or other literature controlled by the manufacturer, at stated Rating Conditions.

3.2.15.1 *Application Rating*

A rating based on tests performed at application Rating Conditions other than Standard Rating Conditions.

3.2.15.2 *Standard Rating*

A rating based on tests performed at Standard Rating Conditions.

3.2.16 *Rating Conditions*

Any set of operating conditions where a single level of performance results and causes only that level of performance to occur.

3.2.16.1 *Standard Rating Conditions*

Rating Conditions used as the basis of comparison for performance.

3.2.17 *Refrigerated Volume (V_r)*

The interior total volume of a Commercial Refrigerated Display Merchandiser or Storage Cabinet as calculated by Appendix C is intended to provide a uniform means of determining the dimensions used to calculate volume, taking into account the special features or functional components, or both that are located within the refrigerated compartment(s). The calculation is not intended to provide a means of measuring the product-storage capacity. This volume calculation only applies to Closed Commercial Refrigerated Display Merchandisers and Storage Cabinets.

3.2.18 *Total Daily Energy Consumption (TDEC)*

A calculated energy consumption value for Self-contained Commercial Refrigerated Display Merchandisers and Storage Cabinets based upon the requirements of this standard expressed in kW·h per day.

3.2.19 *Angle Normal*

The view from a vector perpendicular to a plane tangent to the surface, or the view that has an angle of 90 degrees from the surface.

3.2.20 *Total Display Area (TDA)*

The sum of the projected area(s) of visible product, expressed in m^2 such as portions where product can be viewed from an *angle normal*, or perpendicular, to the transparent area or opening, as calculated by Appendix D.

3.2.20.1 *Transparent Surface*

A transparent surface has greater than or equal to 45% light transmittance, as determined in accordance with ASTM E 1084-86 (Reapproved 2015).

Section 4. Test Requirements

4.1 *Test Requirements*

The tests required for this standard shall be conducted in accordance with ASHRAE 72-2022, except the applications and conditions included in this section.

4.1.1 *Integrated Average Temperature*

An Integrated Average Temperature of the test simulators shall be maintained based on the Product Application.

Documents
Document Sharing Hub
Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

4.1.1.1 *High Temperature Applications*

Commercial Refrigerated Display Merchandisers and Storage Cabinets intended for High Temperature Applications shall have an Integrated Average Temperature of 13°C ± 1.0°C.

4.1.1.2 *Ice Cream Applications*

Commercial Refrigerated Display Merchandisers and Storage Cabinets intended specifically for the storage, display or dispensing of ice cream shall have an Integrated Average Temperature of -26.0°C ± 1.0°C. Equipment that is not designed, marketed, or intended specifically for the storage, display or dispensing of ice cream, is not qualified to be an "ice-cream application". For example, multi-purpose equipment for *low temperature applications* manufactured for storage and display of frozen foods as well as ice cream do not meet the definition in Section 3.2.14.2.

4.1.1.3 *Low Temperature Applications*

Commercial Refrigerated Display Merchandisers and Storage Cabinets intended for Low Temperature Applications to include storing and displaying frozen products, as well as ice cream products, shall have an Integrated Average Temperature of -18°C ± 1.0°C.

4.1.1.4 *Medium Temperature Applications*

Commercial Refrigerated Display Merchandisers and Storage Cabinets intended for Medium Temperature Applications shall have an Integrated Average Temperature of 3°C ± 1.0°C.

4.1.1.5 *Lowest Application Product Temperature (LAPT)*

Models not capable of maintaining Integrated Average Temperatures as specified in Section 3.2.14.1, through Section 3.2.14.5 shall be rated at the lowest Integrated Average Temperature a given unit is capable of maintaining to comply with the steady-state stabilization requirements specified in ASHRAE 72. For remote condensing equipment that is not capable of operating a successful test at a Standard Rating Condition, the LAPT is the temperature achieved with the Dew Point temperature set to the manufacturer's recommended setpoint. For self-contained equipment that is not capable of operating a successful test at a Standard Rating Condition, the LAPT is the temperature achieved at the lowest thermostat setting. The manufacturer shall maintain and provide justification for the reason(s) that the product cannot obtain the Standard Rating Condition.

Note: Commercial Refrigerated Display Merchandisers and Storage Cabinets that are designed for use in multiple temperature applications as defined in Sections 3.2.14.1 through Section 3.2.14.5 by making set point adjustments should be rated under each applicable temperature specified.

4.1.2 *Electrical Conditions*

For all dual nameplate voltage equipment covered by this standard, tests shall be performed at both voltages, or at the lower voltage if only a single rating is published.

4.1.3 *Circulation of Air*

For self-contained refrigerators designed to be installed next to a wall in the direction of the exhaust or intake, or both, a vertical partition or wall shall be located at the minimum clearance as specified in the installation instructions. If the installation instructions do not provide minimum clearance, the vertical partition or wall shall be located 10 cm ± 1 cm from the sides or rear of the cabinet and extend at least 30 cm beyond each side of the cabinet from the floor to not less than 30 cm above the top of the cabinet.

Section 5. Rating Requirements

5.1 *Rating Requirements for Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets*

5.1.1 *General*

This section identifies the necessary data required to calculate the CDEC for Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets.

Documents
Document Sharing Hub
Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets

5.1.2 *CDEC for Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets*

The total electrical load shall be determined using Equation 1.

CEC shall be calculated as described in Section 5.1.2.1.

All other electrical loads shall be measured, either individually or at any shared power supply. These shall include evaporator fan motors, lighting, surface anti-condensate load including fans and heaters, defrost heaters, condensate evaporator pans and any other applicable electrical loads when these are part of the unit as seen in Equation 1.

The following calculations shall be done to determine the CDEC.

$$CDEC = CEC + [FEC + LEC + AEC + DEC + PEC + OEC] \quad \textbf{1}$$

The values are expressed in kW·h per day.

Remote Commercial Refrigerated Display Merchandisers and Storage Cabinets shall record any measured or calculated loads in the calculation of CDEC. Shown below are formulae for the required individual loads under the calculation approach.

5.1.2.1 *Calculation of CEC*

The COP values in Table 1 shall be used to calculate CEC for a 24-hour period. See Equation 2.

The COP values in Table 1 are based on an evaporator temperature and the Commercial Refrigerated Display Merchandiser or Storage Cabinet classification. Commercial Refrigerated Display Merchandisers and Storage Cabinets for Medium and High Temperature Applications shall use an adjusted dew point temperature that is 1.2°C lower than the Commercial Refrigerated Display Merchandiser or Storage Cabinet Dew Point.

Commercial Refrigerated Display Merchandisers and Storage Cabinets for Low Temperature/Ice Cream Applications shall use an adjusted dew point temperature that is 1.7°C lower than the Commercial Refrigerated Display Merchandiser or Storage Cabinet Dew Point. Table 1 shall be used for consistency, understanding that other compressor selections can lead to a different efficiency.

$$CEC = [(Qrt) \cdot (t - tdt)] / (COP \cdot 1000) \quad \textbf{2}$$

For High Glide Refrigerants, the COP used in the CEC calculation shall be determined based on adjusted mid-point evaporator temperature.

The mid-point evaporator temperature, T_m, shall be calculated using the following steps (see Appendix E**Error! Reference source not found.** for example calculation):

1) The entering liquid refrigerant temperature and entering liquid refrigerant pressure of the Commercial Refrigerated Display Merchandiser or Storage Cabinet shall be used to calculate the entering refrigerant enthalpy, h_i.
2) The entering refrigerant enthalpy and suction vapor pressure shall be used to calculate the inlet evaporator refrigerant temperature, T_i.
3) The saturated suction refrigerant Dew Point temperature, T_{sd}, shall be calculated from the suction vapor pressure.
4) The inlet evaporator refrigerant temperature shall be subtracted from the saturated suction refrigerant Dew Point temperature to determine the total refrigerant glide in the evaporator.
   $T_{sd} - T_i = T_g$
5) Divide T_g by 2 and subtract this number from T_{sd}.
6) Round the result to the nearest integer to find T_m, the mid-point evaporator temperature.

T_m – 1.0°C (for Medium Temperature and High Temperature Applications) shall then be used as the adjusted dew point to determine the COP from Table 1.

T_m – 1.7°C (for Low Temperature and Ice Cream Applications) shall then be used as the adjusted dew point to determine the COP from Table 1.

Documents
Document Sharing Hub
Full document details: AHRI Standard 1201-2023 (SI) - Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets