AHRI Standard 1250

2020 Standard for Performance Rating of Walk-in Coolers and Freezers

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Price $10.00 (Members) $20.00 (Non-Members)
Printed in U. S.A.

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PERFORMANCE RATING OF WALK-IN COOLERS AND FREEZERS

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish, for walk-in coolers and freezers: definitions; test requirements; rating requirements; minimum data requirements for Published Ratings; operating requirements; marking and nameplate data and conformance conditions.

1.1.1 *Intent*. This standard is intended for the guidance of the industry, including manufacturers, designers, installers, contractors and users.

1.1.2 *Review and Amendment*. This standard is subject to review and amendment as technology advances.

Section 2. Scope

2.1 *Scope.* This standard applies to mechanical refrigeration equipment consisting of an integrated single package refrigeration unit, or separate unit cooler and condensing unit sections, where the condensing section can be located either outdoor or indoor. Controls may be integral, or can be provided by a separate party as long as performance is tested and certified with the listed mechanical equipment accordingly.

2.2 *Exclusions*. This standard does not apply to:

2.2.1 Enclosures used for telecommunications switch gear or other equipment requiring cooling
2.2.2 Enclosures designed for medical, scientific or research purposes
2.2.3 Performance testing and efficiency characterization of large parallel rack Refrigeration Systems (condensing unit)
2.2.4 Performance testing and efficiency characterization of Walk-in Cooler and Walk-in Freezer refrigeration systems with liquid cooled condensing units
2.2.5 Performance testing and efficiency characterization of Walk-in Cooler and Walk-in Freezer refrigeration systems using Carbon dioxide, glycol, or ammonia.

Section 3. Definitions

All terms in this document will follow the standard industry definitions in the *ASHRAE Terminology* website (https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology) unless otherwise defined in this section.

3.1 *Adaptive Defrost.* A defrost control system that reduces defrost cycle frequency by initiating defrost cycles or adjusting the number of defrost cycles per day in response to operating conditions (e.g., moisture levels in the refrigerated space, coil frost load) rather than initiating defrost cycles strictly based on compressor run time or clock time.

3.2 *Annual Walk-in Energy Factor (AWEF).* A ratio of the total heat, not including the heat generated by the operation of refrigeration systems, removed, in Btu, from a walk-in box during one-year period of usage for refrigeration to the total energy input of refrigeration systems, in watt-hours, during the same period.

3.3 *Dedicated Condensing Unit.* A specific combination of Refrigeration System components for a given refrigerant, consisting of an assembly that
(1) Includes one or more electric motor driven positive displacement compressors, condensers, and accessories as provided by the manufacturer; and
(2) Is designed to serve one refrigerated load.

3.4 *Energy Efficiency Ratio (EER).* A ratio of the Refrigeration Capacity in Btu/h to the power input values in watts at any given set of Rating Conditions expressed in Btu/W·h.

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3.5 *Off-cycle.* The operating state of a system when it is not in refrigeration mode. This does not include transient conditions such as pump-down. Typical items running during the Off-cycle include controls or crankcase heaters.

3.6 *On-cycle.* The operating state of a system when it is in refrigeration mode. This is a Steady-state condition and does not include transient conditions such as start-up or pull down. Typical items running during the On-cycle include evaporator fans, condenser fans, compressor, and any controls.

3.7 *Published Rating.* A statement of the assigned values of those performance characteristics, under stated rating conditions, by which a unit may be chosen to fit its application. These values apply to all units of like nominal size and type (identification) produced by the same manufacturer. The term Published Rating 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.

3.7.1 *Application Rating*. A rating based on tests performed at application Rating Conditions, (other than Standard Rating Conditions).

3.7.2 *Standard Rating*. A rating based on tests performed at Standard Rating Conditions.

3.8 *Rating Conditions.* Any set of operating conditions under which a single level of performance results and which causes only that level of performance to occur

3.8.1 *Standard Ratings Conditions.* Rating conditions used as the basis of comparison for performance characteristics.

3.9 *Refrigeration Capacity.* The capacity associated with the increase in total enthalpy between the liquid refrigerant entering the expansion valve and superheated return gas multiplied by the mass flow rate of the refrigerant.

3.9.1 *Gross Refrigeration Capacity.* The heat absorbed by the refrigerant, Btu/h. This is the sum of the Net Refrigeration Capacity and the heat equivalent of the energy required to operate the Unit Cooler. This includes both sensible and latent cooling.

3.9.2 *Net Refrigeration Capacity.* The refrigeration capacity available for space and product cooling, Btu/h. It is equal to the Gross Refrigeration Capacity less the heat equivalent of energy required to operate the Unit Cooler (e.g.: evaporator fans, defrost cycle)

3.10 *Refrigeration System.* The mechanism (including all controls and other components integral to the system's operation) used to create the refrigerated environment in the interior of a walk-in cooler or walk-in freezer, consisting of a Dedicated Condensing Unit or a Unit Cooler.

3.10.1 *Matched Refrigeration System (Matched-pair).* A combination of a Dedicated Condensing Unit and one or more Unit Coolers specified by the Dedicated Condensing Unit manufacturer which are all distributed in commerce together. Single-Packaged Dedicated Systems are a subset of Matched Refrigeration Systems.

3.10.2 *Single-packaged Refrigeration System (Single-packaged).* A Matched Refrigeration System that is a Single-packaged assembly that includes one or more compressors, a condenser, a means for forced circulation of refrigerated air, and elements by which heat is transferred from air to refrigerant, without any element external to the system imposing resistance to flow of the refrigerated air.

3.11 *Saturation Temperature.* Refrigerant temperature at the Unit Cooler inlet or outlet determined either by measuring the temperature at the outlet of the two-phase refrigerant flow, for a Liquid Overfeed Unit Cooler, or by measuring refrigerant pressure and determining the corresponding temperature from reference thermodynamic tables or equations for the refrigerant, expressed in ºF. For zeotropic refrigerants, the corresponding temperature to a measured pressure is the refrigerant Dew Point or bubble point accordingly.

3.12 *"Shall" or "Should". "Shall" or "should" shall be interpreted as follows:*

3.12.1 *Shall*. Where "shall" or "shall not" is used for a provision specified, that provision is mandatory if compliance with the standard is claimed.

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3.12.2 *Should.* "Should," is used to indicate provisions which are not mandatory, but which are desirable as good practice.

3.13 *Steady-state.* An operating state of a system, including its surroundings, in which the extent of change with time is within the required limits within this standard.

3.14 *Test Reading.* The recording of one full set of the test measurements required to assess the performance of the test unit. The reading of a specific test instrument at a specific point in time. The test measurement may be averaged with other measurements of the same parameter at the same time to determine a Test Reading or averaged over the duration of the test to determine the value for the test run.

3.15 *Total Walk-in System Heat Load.* Total heat load to the walk-in system including Walk-in Box Load and the heat load to the box contributed by the operation of the Refrigeration System.

3.15.1 *Walk-in System High Load ($\dot{W}LH$).* Total Walk-in System Heat Load during a High Load Period.
3.15.2 *Walk-in System Low Load ($\dot{W}LL$).* Total Walk-in System Heat Load during a Low Load Period.

3.16 *Unit Cooler.* A forced-circulation free-delivery assembly, including means for forced air circulation and elements by which heat is transferred from air to refrigerant without any element external to the cooler imposing air resistance. These may also be referred to as Air Coolers, Cooling Units, Air Units or Evaporators.

3.17 *Walk-in Box Load*. Heat load to the walk-in box resulting from conduction, infiltration and internal heat gains from equipment that is not related to the refrigeration system, such as lights and anti-sweat heaters, etc.

3.17.1 *High Box Load ($\dot{B}LH$).* Walk-in Box Load during a High Load Period.
3.17.2 *Low Box Load ($\dot{B}LL$).* Walk-in Box Load during a Low Load Period.

3.18 *Walk-in Cooler (Refrigerator) and Walk-in Freezer (Freezer).* An enclosed storage space refrigerated to temperatures, respectively, above, and at or below 32 °F that can be walked into, and has a total chilled storage area of less than 3,000 ft^2. Also referred to as WICF.

3.19 *WICF Load Factor.* A ratio of the Total Walk-in System Heat Load to the Steady-state Net Refrigeration Capacity.

3.20 *WICF Load Period.* A twenty-four-hour day.

3.20.1 *WICF High Load Period*. The period of the day corresponding to frequent door openings, product loading events, and other design Load Factors. For the purposes of this standard, this period shall be 8 continuous hours.

3.20.2 *WICF Low Load Period*. The period of the day other than the High Load Period. For the purposes of this standard, this period shall be the remaining 16 continuous hours of the total Load Period.

Section 4. Instrumentation Accuracy and Test Tolerances

4.1 *Instruments Accuracy.* All measuring instruments shall be selected to meet or exceed the accuracy criteria listed in Table 1 for each type of measurement. Precision instruments and automated electronic data acquisition equipment shall be used to measure and record temperature, pressure and refrigerant flow rate test parameters. All measuring instruments and instrument systems (e.g., data acquisition coupled to temperature, pressure, or flow sensors) shall be calibrated by comparison to primary or secondary standards with calibrations traceable to National Institute of Standards and Technology (NIST) measurements, other recognized national laboratories, or derived from accepted values of natural physical constants. All test instruments shall be calibrated annually, whenever damaged, or when the accuracy is called into question.

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Table 1. Instrumentation Accuracy	
Measurement	Minimum Accuracy
Temperature, Air Entering/Leaving , °F	± 0.25
Temperature, Refrigerant Liquid/Vapor at Unit Cooler In/Out, °F	± 0.5
Temperature, Others, °F	± 1
Air Relative Humidity, %	± 3
Refrigerant Pressure, psi	Pressure corresponding to ± 0.2 °F of Saturation Temperature
Air Pressure, in Hg	±0.05
Refrigerant Flow	1 % of reading
Liquid Flow	1 % of reading
Electrical, Motor kilowatts/amperes/voltage	1 % of reading
Electrical, Auxiliary kilowatt input (e.g. heater)	
Speed, Motor / fan shaft	1 % of reading
Brine Specific Gravity	1 % of reading
Time, Hours / minutes / seconds	0.5 % of time interval

4.2 *Test Operating and Test Condition Tolerances.* Unless otherwise specified, all Steady-state temperature, pressure, mass flow, electrical voltage, and electrical frequency measurements, shall be made in accordance with Table 2 or Table 3, as appropriate.

4.2.1 *Provisions for Unit Coolers Tested Alone.* If the test operating or test condition tolerances specified in Table 3 cannot be achieved due to factory supplied expansion device and/or liquid solenoid, those components may be removed from the refrigerant flow circuit. However, the removed components shall remain energized and included in the measurement of energy consumption.

Table 2. Test Operating and Test Condition Tolerances for Matched-pairs and Dedicated Condensing Units Tested Alone Steady-state Test			
Measurement	Location	Test Operating Tolerance [1]	Test Condition Tolerance [2]
Indoor dry-bulb, °F	Entering temperature[6]	± 4.0	± 0.5
Indoor wet-bulb, °F	Entering temperature[6]	± 4.0	± 0.5
Outdoor dry-bulb, °F	Entering temperature[6]	± 4.0	± 1.0
Outdoor wet-bulb[3], °F	Entering temperature[6]	± 2.0	± 1.0
Electrical voltage, % of reading[4]	All	± 2.0	± 1.0
Electrical Frequency, % of reading	All	± 1.0	± 1.0
Refrigerant Mass Flow Rate	All	Greater of: 3 lb/h or 2% of reading	-
Pressure[5], % of reading	Suction	2%	1%

Notes:
1. Test operating tolerance is the maximum permissible range of any measurement. When expressed as a percentage, the maximum allowable variation is the specified percentage of the average value.
2. Test condition tolerance is the maximum permissible variation of the average value of the measurement from the specified test condition.
3. Outdoor wet bulb temperature tolerance applies only to units with evaporative cooling and Single-packaged Systems.
4. For three-phase power, voltage imbalance shall be no more than 2 % from phase to phase.
5. Suction pressure tolerances apply to only Dedicated Condensing Units tested alone.
6. Measured at air entering location, as specified in Section C3.1 of Appendix C.

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Table 3. Test Operating and Test Condition Tolerances for Unit Coolers Tested Alone Steady-state Test

Measurement	Location	Test Operating Tolerance [1]	Test Condition Tolerance [2]
Indoor dry-bulb, °F	Entering temperature[3]	± 1.0	± 0.5
Indoor wet-bulb, °F	Entering temperature[3]	± 1.0	± 0.5
Air dry-bulb temperature difference, °F	Entering temperature[3]	± 0.5	-
Refrigerant Mass Flow Rate	All	Greater of: 3 lb/h or 2% of reading	-
Inlet Saturation Temperature, °F	Entering temperature	± 5.0	± 2.5
Inlet Subcooling, °F	Entering temperature	± 5.0	± 2.0
Outlet Saturation Temperature, °F	Leaving temperature	± 1.0	± 0.5
Outlet Superheat, °F	Leaving temperature	± 1.5	± 1.0
Electrical voltage, % of reading[4]	All	± 2.0	± 1.0
Electrical Frequency, % of reading	All	± 1.0	± 1.0

Notes:
1. Test operating tolerance is the maximum permissible range of any measurement. When expressed as a percentage, the maximum allowable variation is the specified percentage of the average value.
2. Test condition tolerance is the maximum permissible variation of the average value of the measurement from the specified test condition.
3. Measured at air entering location, as specified in Section C3.1 of Appendix C.
4. For three-phase power, voltage imbalance shall be no more than 2% from phase to phase.

Section 5. Testing and Rating Requirements

5.1 *Method of Test.* The method of test for walk-in cooler and freezer systems that have matched Unit Coolers and Dedicated Condensing Units, and the procedures of testing Dedicated Condensing Units and Unit Coolers individually are described in Appendix C of this standard.

5.2 *Standard Ratings.*

5.2.1 *Standard Rating Conditions.* Standard rating conditions for medium and low temperature Matched Refrigeration Systems (Matched-pairs), Unit Coolers tested alone, and Dedicated Condensing Units tested alone are established in Tables 4 through 17. The unit under test shall use the table that corresponds to the unit's configuration. All testing shall be performed at the nameplate rated voltage(s) and frequency. For equipment which is rated with 208-230 V dual nameplate voltages, Standard Rating tests shall be performed at 230 V. For all other dual nameplate voltage equipment covered by this standard, the Standard Rating tests shall be performed at both voltages or at the lower of the two voltages if only a single Standard Rating is to be published.

5.2.2 *Measured Values.* Each unit under test shall have all values listed in the "Test Objective" column of the table determined using the appropriate test methods established in Appendix C.

5.2.3 *Published Standard Ratings.*

5.2.3.1 *Annual Walk-in Energy Factor (AWEF)* shall be calculated for each unit under test, according to Section 7 of this standard

5.2.3.2 *Net Refrigeration Capacity* shall be determined for each Steady-state condition listed in the applicable Standards Ratings Conditions table (see Tables 4 through 17). Net Refrigeration Capacity is calculated in Section 7 for Dedicated Condensing Units tested alone and is measured directly as dictated in Appendix C for Matched-pairs and Unit Coolers tested alone.

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5.3 *Application Ratings.*

5.3.1 *Application Rating Conditions* are any operating conditions other than those established in Tables 4 through 17.

5.3.2 *Measured Values.* Each unit under test shall determine all measured values e.g., on-cycle power, off-cycle power, net or gross refrigeration capacity, and defrost cycle power (if applicable)) using the appropriate test methods established in Appendix C.

5.3.3 *Published Application Ratings.* One or more of the following shall be published for an Application Rating point.

5.3.3.1 *Net Refrigeration Capacity* shall be determined for each application rating condition. Net Refrigeration Capacity is calculated in Section 7 for Dedicated Condensing Units tested alone and is measured directly as dictated in Appendix C for Matched-pairs and Unit Coolers tested alone.

5.3.3.2 *Energy Efficiency Ratio (EER)* shall be calculated for each Steady-state application rating condition, for Matched-pair, Single-packaged, and Dedicated Condensing Units tested alone. EER is calculated as the Net Refrigeration Capacity (in Btu/h) to the system steady-state power consumption ($\dot{E}_{ss}$) (in watts). The system Steady-state power consumption includes power consumptions of compressor(s), both condenser and evaporator fans, and any other components that consume power during the Steady-state On-cycle test. EER is expressed in Btu/W·h.

5.3.3.3 *Application Rating Conditions* shall be reported when Net Refrigeration Capacity and/or EER is published. Specifically, all ambient and/or refrigerant condition categories listed in the operating condition tables (Tables 4 through 17), shall be published, for the specific application rating condition.

5.4 *Acceptance Criteria.* To comply with this standard, measured test results shall not be less than 95% of Published Ratings for Capacity, AWEF and EER.

Table 4. Standard Rating Conditions for Fixed Capacity Refrigerator Matched-pair, Dedicated Condensing Unit Located Indoor

Test Title	Unit Cooler Air Entering Dry-bulb, ˚F	Unit Cooler Air Entering Relative Humidity, %	Condenser Air Entering Dry-bulb, ˚F	Condenser Air Entering Wet-bulb[1], ˚F	Compressor Operating Mode	Test Objective
Refrigeration Capacity, Ambient Condition A	35	<50	90	75[1], 65[2]	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss}$ and input power, $\dot{E}_{ss}$
Off-cycle Power	35	<50	90	-	Compressor Off	Measure total input wattage during compressor off cycle, ($\dot{E}_{cu,off}$ + $\dot{E}F_{comp,off}$)

Note:
1. Required only for evaporative Dedicated Condensing Units.
2. Maximum allowable value for Single-packaged Systems that do not use evaporative Dedicated Condensing Units, where all or part of the equipment is located in the outdoor room.

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Table 5. Standard Rating Conditions for Fixed Capacity Refrigerator Matched-pair, Dedicated Condensing Unit Located Outdoor

Test Title	Unit Cooler Air Entering Dry-bulb, ˚F	Unit Cooler Air Entering Relative Humidity, %	Condenser Air Entering Dry-bulb, ˚F	Condenser Air Entering Wet-bulb, ˚F	Compressor Operating Mode	Test Objective
Refrigeration Capacity, Ambient Condition A	35	<50	95	75[1], 68[2]	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}$ and input power, $\dot{E}_{ss,A}$ at high temperature condition
Off-cycle Power, Ambient Condition A	35	<50	95	75[1], 68[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, $(\dot{E}_{cu,off} + \dot{E}F_{comp,off})$
Refrigeration Capacity, Ambient Condition B	35	<50	59	54[1], 46[2]	Compressor On	Determine Net Refrigeration Capacity, $\dot{q}_{ss,B}$, of Unit Cooler and system input power, $\dot{E}_{ss,B}$
Off-cycle Power, Ambient Condition B	35	<50	59	54[1], 46[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, $(\dot{E}_{cu,off} + \dot{E}F_{comp,off})$
Refrigeration Capacity, Ambient Condition C	35	<50	35	34[1], 29[2]	Compressor On	Determine Net Refrigeration Capacity,$\dot{q}_{ss,C}$, of Unit Cooler and system input power, $\dot{E}_{ss,C}$
Off-cycle Power, Ambient Condition C	35	<50	35	34[1], 29[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, $(\dot{E}_{cu,off} + \dot{E}F_{comp,off})$

Note:
1. Required only for evaporative Dedicated Condensing Units.
2. Maximum allowable value for Single-packaged Systems that do not use evaporative Dedicated Condensing Units, where all or part of the equipment is located in the outdoor room.

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Table 6. Standard Rating Conditions for Two Capacity Refrigerator Matched-pair, Dedicated Condensing Unit Located Outdoor

Test Title	Unit Cooler Air Entering Dry-bulb, ˚F	Unit Cooler Air Entering Relative Humidity, %	Condenser Air Entering Dry-bulb, ˚F	Condenser Air Entering Wet-bulb, ˚F	Compressor Operating Mode	Test Objective
Refrigeration Capacity, Ambient Condition A Low Speed	35	<50	95	75[1], 68[2]	Minimum Capacity	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}^{k=1}$, and input power, $\dot{E}_{ss,A}^{k=1}$
Refrigeration Capacity, Ambient Condition A High Speed	35	<50	95	75[1], 68[2]	Maximum Capacity	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}^{k=2}$ and input power, $\dot{E}_{ss,A}^{k=2}$
Off-cycle Power, Ambient Condition A	35	<50	95	75[1], 68[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$ + $\dot{E}\dot{F}_{comp,off}$)
Refrigeration Capacity, Ambient Condition B Low Speed	35	<50	59	54[1], 46[2]	Minimum Capacity	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,B}^{k=1}$, and system input power, $\dot{E}_{ss,B}^{k=1}$
Refrigeration Capacity, Ambient Condition B High Speed	35	<50	59	54[1], 46[2]	Maximum Capacity	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,B}^{k=2}$, and system input power, $E_{ss,B}^{k=2}$
Off-cycle Power, Ambient Condition B	35	<50	59	54[1], 46[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$ + $\dot{E}\dot{F}_{comp,off}$)
Refrigeration Capacity, Ambient Condition C Low Speed	35	<50	35	34[1], 29[2]	Minimum Capacity	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,C}^{k=1}$, and system input power, $\dot{E}_{ss,C}^{k=1}$

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Table 6. Standard Rating Conditions for Two Capacity Refrigerator Matched-pair, Dedicated Condensing Unit Located Outdoor (continued)

Refrigeration Capacity, Ambient Condition C High Speed	35	<50	35	34[1], 29[2]	Maximum Capacity	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,C}^{k=2}$, and system input power, $\dot{E}_{ss,C}^{k=2}$
Off-cycle Power, Ambient Condition C	35	<50	35	34[1], 29[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$ + $\dot{E}F_{comp,off}$)

Note:
1. Required only for evaporative Dedicated Condensing Units.
2. Maximum allowable value for Single-packaged Systems that do not use evaporative Dedicated Condensing Units, where all or part of the equipment is located in the outdoor room.

Table 7. Standard Rating Conditions for Variable Capacity Refrigerator Matched-pair, Dedicated Condensing Unit Located Outdoor

Test Title	Unit Cooler Air Entering Dry-bulb, °F	Unit Cooler Air Entering Relative Humidity, %	Condenser Air Entering Dry-bulb, °F	Condenser Air Entering Wet-bulb, °F	Compressor Operating Mode	Test Objective
Refrigeration Capacity, Ambient Condition A Low Speed	35	<50	95	75[1], 68[2]	Minimum Capacity, k=1	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}^{k=1}$, and system input power, $\dot{E}_{ss,A}^{k=1}$
Refrigeration Capacity, Ambient Condition A Variable Speed	35	<50	95	75[1], 68[2]	Intermediate Capacity[3], k=i	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}^{k=i}$, and system input power, $\dot{E}_{ss,A}^{k=i}$
Refrigeration Capacity, Ambient Condition A High Speed	35	<50	95	75[1], 68[2]	Maximum Capacity, k=2	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}^{k=2}$ and system input power, $\dot{E}_{ss,A}^{k=2}$
Off-cycle Power, Ambient Condition A	35	<50	95	75[1], 68[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$ + $\dot{E}F_{comp,off}$)

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Table 7. Standard Rating Conditions for Variable Capacity Refrigerator Matched-pair, Dedicated Condensing Unit Located Outdoor (continued)

Refrigeration Capacity, Ambient Condition B Low Speed	35	<50	59	54[1], 46[2]	Minimum Capacity, k=1	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,B}^{k=1}$, and system input power, $\dot{E}_{ss,B}^{k=1}$
Refrigeration Capacity, Ambient Condition B Variable Speed	35	<50	59	54[1], 46[2]	Intermediate Capacity[3] k=i	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,B}^{k=i}$, and system input power, $\dot{E}_{ss,B}^{k=i}$
Refrigeration Capacity, Ambient Condition B High Speed	35	<50	59	54[1], 46[2]	Maximum Capacity, k=2	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,B}^{k=2}$ and system input power, $\dot{E}_{ss,B}^{k=2}$
Off-cycle Power, Ambient Condition B	35	<50	59	54[1], 46[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$ + $\dot{EF}_{comp,off}$)
Refrigeration Capacity, Ambient Condition C Low Speed	35	<50	35	34[1], 29[2]	Minimum Capacity, k=1	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,C}^{k=1}$, and system input power, $\dot{E}_{ss,C}^{k=1}$, at cold condition and minimum compressor capacity
Refrigeration Capacity, Ambient Condition C Variable Speed	35	<50	35	34[1], 29[2]	Intermediate Capacity[3], k=i	Determine Net Refrigeration Capacity of Unit Cooler $\dot{q}_{ss,C}^{k=i}$, and system input power, $\dot{E}_{ss,C}^{k=i}$, at cold condition and intermediate compressor capacity
Refrigeration Capacity, Ambient Condition C High Speed	35	<50	35	34[1], 29[2]	Maximum Capacity, k=2	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,C}^{k=2}$ and system input power, $\dot{E}_{ss,C}^{k=2}$, at cold condition and maximum compressor capacity
Off-cycle Power, Ambient Condition C	35	<50	35	34[1], 29[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$ + $\dot{EF}_{comp,off}$)

Notes:

1. Required only for evaporative Dedicated Condensing Units.
2. Maximum allowable value for Single-packaged Systems that do not use evaporative Dedicated Condensing Units, where all or part of the equipment is located in the outdoor room.
3. For the intermediate capacity test, the compressor capacity shall be set to an additional capacity stage that is closest to the average of the minimum and maximum capacity.

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Table 8. Standard Rating Conditions for Fixed Capacity Freezer Matched-pair, Dedicated Condensing Unit Located Indoor						
Test Title	Unit Cooler Air Entering Dry-bulb, ˚F	Unit Cooler Air Entering Relative Humidity, %	Condenser Air Entering Dry-bulb, ˚F	Condenser Air Entering Wet-bulb, ˚F	Compressor Operating Mode	Test Objective
Refrigeration Capacity, Ambient Condition A	-10	<50	90	75[1], 65[2]	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}$ and system input power, $\dot{E}_{ss,A}$
Off-cycle Power	-10	<50	90	75[1], 65[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, $(\dot{E}_{cu,off} + \dot{E}F_{comp,off})$
Defrost	-10	<50			System Dependent	Test according to Appendix C Section C10, $\dot{D}F$, $\dot{Q}_{DF}$.

Note:
1. Required only for evaporative Dedicated Condensing Units.
2. Maximum allowable value for Single-packaged Systems that do not use evaporative Dedicated Condensing Units, where all or part of the equipment is located in the outdoor room.

Table 9. Standard Rating Conditions for Fixed Capacity Freezer Matched-pair, Dedicated Condensing Unit Located Outdoor						
Test Title	Unit Cooler Air Entering Dry-bulb, ˚F	Unit Cooler Air Entering Relative Humidity, %	Condenser Air Entering Dry-bulb, ˚F	Condenser Air Entering Wet-bulb, ˚F	Compressor Operating Mode	Test Objective
Refrigeration Capacity, Ambient Condition A	-10	<50	95	75[1], 68[2]	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}$ and system input power, $\dot{E}_{ss,A}$
Off-cycle Power, Ambient Condition A	-10	<50	95	75[1], 68[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, $(\dot{E}_{cu,off} + \dot{E}F_{comp,off})$
Refrigeration Capacity, Ambient Condition B	-10	<50	59	54[1], 46[2]	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,B}$, and system input power, $\dot{E}_{ss,B}$, at moderate condition
Off-cycle Power, Ambient Condition B	-10	<50	59	54[1], 46[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, $(\dot{E}_{cu,off} + \dot{E}F_{comp,off})$

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Table 9. Standard Rating Conditions for Fixed Capacity Freezer Matched-pair, Dedicated Condensing Unit Located Outdoor (continued)						
Refrigeration Capacity, Ambient Condition C	-10	<50	35	34[1], 29[2]	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,C}$, and system input power, $\dot{E}_{ss,C}$, at cold condition
Off-cycle Power, Ambient Condition C	-10	<50	35	34[1], 29[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$ + $\dot{E}F_{comp,off}$)
Defrost	-10	<50			System Dependent	Test according to Appendix C Section C10, $\dot{D}F$, $\dot{Q}_{DF}$.

Note:
1. Required only for evaporative Dedicated Condensing Units.
2. Maximum allowable value for Single-packaged Systems that do not use evaporative Dedicated Condensing Units, where all or part of the equipment is located in the outdoor room.

Table 10. Standard Rating Conditions for Two Capacity Freezer Matched-pair, Dedicated Condensing Unit Located Outdoor

Test Title	Unit Cooler Air Entering Dry-bulb, ˚F	Unit Cooler Air Entering Relative Humidity, %	Condenser Air Entering Dry-bulb, ˚F	Condenser Air Entering Wet-bulb, ˚F	Compressor Operating Mode	Test Objective
Refrigeration Capacity, Ambient Condition A Low Speed	-10	<50	95	75[1], 68[2]	Minimum Capacity, k=1	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}^{k=1}$, and input power, $\dot{E}_{ss,A}^{k=1}$
Refrigeration Capacity, Ambient Condition A High Speed	-10	<50	95	75[1], 68[2]	Maximum Capacity, k=2	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}^{k=2}$ and input power, $\dot{E}_{ss,A}^{k=2}$
Off-cycle Power, Ambient Condition A	-10	<50	95	75[1], 68[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$ + $\dot{E}F_{comp,off}$)

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Table 10. Standard Rating Conditions for Two Capacity Freezer Matched-pair, Dedicated Condensing Unit Located Outdoor (continued)

Refrigeration Capacity, Ambient Condition B Low Speed	-10	<50	59	54[1], 46[2]	Minimum Capacity, k=1	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,B}^{k=1}$, and system input power, $\dot{E}_{ss,B}^{k=1}$
Refrigeration Capacity, Ambient Condition B High Speed	-10	<50	59	54[1], 46[2]	Maximum Capacity, k=2	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,B}^{k=2}$, and system input power, $E_{ss,B}^{k=2}$
Off-cycle Power, Ambient Condition B	-10	<50	59	54[1], 46[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, $(\dot{E}_{cu,off} + \dot{EF}_{comp,off})$
Refrigeration Capacity, Ambient Condition C Low Speed	-10	<50	35	34[1], 29[2]	Minimum Capacity, k=1	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,C}^{k=1}$, and system input power, $\dot{E}_{ss,C}^{k=1}$
Refrigeration Capacity, Ambient Condition C High Speed	-10	<50	35	34[1], 29[2]	Maximum Capacity, k=2	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,C}^{k=2}$, and system input power, $\dot{E}_{ss,C}^{k=2}$
Off-cycle Power, Ambient Condition C	-10	<50	35	34[1], 29[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, $(\dot{E}_{cu,off} + \dot{EF}_{comp,off})$
Defrost	-10	<50			System Dependent	Test according to Appendix C Section C10, $\dot{DF}$, $\dot{Q}_{DF}$.

Note:
1. Required only for evaporative Dedicated Condensing Units.
2. Maximum allowable value for Single-packaged Systems that do not use evaporative Dedicated Condensing Units, where all or part of the equipment is located in the outdoor room.

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Table 11. Standard Rating Conditions for Variable Capacity Freezer Matched-pair, Dedicated Condensing Unit Located Outdoor

Test Title	Unit Cooler Air Entering Dry-bulb, ˚F	Unit Cooler Air Entering Relative Humidity, %	Condenser Air Entering Dry-bulb, ˚F	Condenser Air Entering Wet-bulb, ˚F	Compressor Operating Mode	Test Objective
Refrigeration Capacity, Ambient Condition A Low Speed	-10	<50	95	75[1], 68[2]	Minimum Capacity, k=1	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}^{k=1}$, and system input power, $\dot{E}_{ss,A}^{k=1}$
Refrigeration Capacity, Ambient Condition A Variable Speed	-10	<50	95	75[1], 68[2]	Intermediate Capacity[3], k=i	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}^{k=i}$, and system input power, $\dot{E}_{ss,A}^{k=i}$,
Refrigeration Capacity, Ambient Condition A High Speed	-10	<50	95	75[1], 68[2]	Maximum Capacity, k=2	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,A}^{k=2}$ and system input power, $\dot{E}_{ss,A}^{k=2}$
Off-cycle Power, Ambient Condition A	-10	<50	95	75[1], 68[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off} + \dot{E}F_{comp,off}$)
Refrigeration Capacity, Ambient Condition B Low Speed	-10	<50	59	54[1], 46[2]	Minimum Capacity, k=1	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,B}^{k=1}$, and system input power, $\dot{E}_{ss,B}^{k=1}$
Refrigeration Capacity, Ambient Condition B Variable Speed	-10	<50	59	54[1], 46[2]	Intermediate Capacity[3], k=i	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,B}^{k=i}$, and system input power, $\dot{E}_{ss,B}^{k=i}$
Refrigeration Capacity, Ambient Condition B High Speed	-10	<50	59	54[1], 46[2]	Maximum Capacity, k=2	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,B}^{k=2}$ and system input power, $\dot{E}_{ss,B}^{k=2}$

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Table 11. Standard Rating Conditions for Variable Capacity Freezer Matched-pair, Dedicated Condensing Unit Located Outdoor (continued)						
Off-cycle Power, Ambient Condition B	-10	<50	59	54[1], 46[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off} + \dot{E}F_{comp,off}$)
Refrigeration Capacity, Ambient Condition C Low Speed	-10	<50	35	34[1], 29[2]	Minimum Capacity, k=1	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,C}^{k=1}$, and system input power, $\dot{E}_{ss,C}^{k=1}$
Refrigeration Capacity, Ambient Condition C Variable Speed	-10	<50	35	34[1], 29[2]	Intermediate Capacity[3], k=i	Determine Net Refrigeration Capacity of Unit Cooler $\dot{q}_{ss,C}^{k=i}$, and system input power, $\dot{E}_{ss,C}^{k=1}$
Refrigeration Capacity, Ambient Condition C High Speed	-10	<50	35	34[1], 29[2]	Maximum Capacity, k=2	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{ss,C}^{k=2}$ and system input power, $\dot{E}_{ss,C}^{k=1}$
Off-cycle Power, Ambient Condition C	-10	<50	35	34[1], 29[2]	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off} + \dot{E}F_{comp,off}$)
Defrost	-10	<50			System Dependent	Test according to Appendix C Section C10, $\dot{D}F$, $\dot{Q}_{DF}$.

Notes:

1. Required only for evaporative Dedicated Condensing Units.
2. Maximum allowable value for Single-packaged Systems that do not use evaporative Dedicated Condensing Units, where all or part of the equipment is located in the outdoor room.
3. For the intermediate capacity test, the compressor capacity shall be set to an additional capacity stage that is closest to the average of the minimum and maximum capacity.

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Table 12. Standard Rating Conditions for Fixed Capacity Refrigerator Dedicated Condensing Unit, Dedicated Condensing Unit Located Indoor[1]

Test Title	Suction Dew Point, ˚F	Return Gas[2], ˚F	Condenser Air Entering Dry-bulb, ˚F	Condenser Air Entering Wet-bulb[3], ˚F	Compressor Operating Mode	Test Objective
Refrigeration Capacity, Ambient Condition A	23	41	90	75	Compressor On	Determine Gross Refrigeration Capacity, $\dot{Q}_{gross,i}$, and input power, $\dot{E}_{CU,on}$, of Dedicated Condensing Unit
Off-cycle Power	-	-	90	75	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$)

Notes:
1. Subcooling shall be set according to equipment specification and reported as part of standard rating.
2. Measured at the Dedicated Condensing Unit inlet location.
3. Required only for evaporative Dedicated Condensing Units.

Table 13. Standard Rating Conditions for Fixed Capacity Refrigerator Dedicated Condensing Unit, Dedicated Condensing Unit Located Outdoor[1]

Test Title	Suction Dew Point, ˚F	Return Gas[2], ˚F	Condenser Air Entering Dry-bulb, ˚F	Condenser Air Entering Wet-bulb[3], ˚F	Compressor Operating Mode	Test Objective
Refrigeration Capacity, Ambient Condition A	23	41	95	75	Compressor On	Determine Gross Refrigeration Capacity, $\dot{Q}_{gross,A}$, and input power, $\dot{E}_{CU,on,A}$, of Dedicated Condensing Unit
Off-cycle Power, Ambient Condition A	-	-	95	75	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$)
Refrigeration Capacity Ambient Condition B	23	41	59	54	Compressor On	Determine Gross Refrigeration Capacity, $\dot{Q}_{gross,B}$, and input power, $\dot{E}_{CU,on,B}$, of Dedicated Condensing Unit
Off-cycle Power, Ambient Condition B	-	-	59	54	Compressor off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$)
Refrigeration Capacity Ambient Condition C	23	41	35	34	Compressor On	Determine Gross Refrigeration Capacity, $\dot{Q}_{gross,C}$, and input power, $\dot{E}_{CU,on,C}$, of Dedicated Condensing Unit
Off-cycle Power, Ambient Condition C	-	-	35	34	Compressor off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$)

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Table 13. Standard Rating Conditions for Fixed Capacity Refrigerator Dedicated Condensing Unit, Dedicated Condensing Unit Located Outdoor[1] (continued)

Notes:
1. Subcooling shall be set according to equipment specification and reported as part of standard rating.
2. Measured at the Dedicated Condensing Unit inlet location.
3. Required only for evaporative Dedicated Condensing Units.

Table 14. Standard Rating Conditions for Fixed Capacity Freezer Dedicated Condensing Unit, Dedicated Condensing Unit Located Indoor[1]

Test Title	Suction Dew Point, ˚F	Return Gas[2], ˚F	Condenser Air Entering Dry-bulb , ˚F	Condenser Air Entering Wet-bulb[3], ˚F	Compressor Operating Mode	Test Objective
Refrigeration Capacity, Ambient Condition A	-22	5	90	75	Compressor On	Determine Gross Refrigeration Capacity, $\dot{Q}_{gross,i}$, and input power, $\dot{E}_{CU,on}$, of Dedicated Condensing Unit
Off-cycle Power	-	-	90	75	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$)

Notes:
1. Subcooling shall be set according to equipment specification and reported as part of standard rating.
2. Measured at the Dedicated Condensing Unit inlet location.
3. Required only for evaporative Dedicated Condensing Units.

Table 15. Standard Rating Conditions for Fixed Capacity Freezer Dedicated Condensing Unit, Dedicated Condensing Unit Located Outdoor[1]

Test Title	Suction Dew Point, ˚F	Suction Gas[2], ˚F	Condenser Air Entering Dry-bulb, ˚F	Condenser Air Entering Wet-bulb[3], ˚F	Compressor Operating Mode	Test Objective
Refrigeration Capacity, Ambient Condition A	-22	5	95	75	Compressor On	Determine Gross Refrigeration Capacity, $\dot{Q}_{gross,A}$, and input power, $\dot{E}_{CU,on,A}$, of Dedicated Condensing Unit
Off-cycle Power, Ambient Condition A	-	-	95	75	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$)
Refrigeration Capacity, Ambient Condition B	-22	5	59	54	Compressor On	Determine Gross Refrigeration Capacity, $\dot{Q}_{gross,B}$, and input power, $\dot{E}_{CU,on,B}$, of Dedicated Condensing Unit
Off-cycle Power, Ambient Condition B	-	-	59	54	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$)
Refrigeration Capacity, Ambient Condition C	-22	5	35	34	Compressor On	Determine Gross Refrigeration Capacity, $\dot{Q}_{gross,C}$, and input power, $\dot{E}_{CU,on,C}$, of Dedicated Condensing Unit
Off-cycle Power, Ambient Condition C	-	-	35	34	Compressor Off	Measure total input wattage during compressor Off-cycle, ($\dot{E}_{cu,off}$)

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Table 15. Standard Rating Conditions for Fixed Capacity Freezer Dedicated Condensing Unit, Dedicated Condensing Unit Located Outdoor[1]

Notes:
1. Subcooling shall be set according to equipment specification and reported as part of standard rating.
2. Measured at the Dedicated Condensing Unit inlet location.
3. Required only for evaporative Dedicated Condensing Units

Table 16. Standard Rating Conditions for Refrigerator Unit Cooler[1]

Test Title	Unit Cooler Air Entering Dry-bulb, ˚F	Unit Cooler Air Entering Relative Humidity, %	Suction Dew Point Temp[2], ˚F	Liquid Inlet Bubble Point Temperature, ˚F	Liquid Inlet Subcooling, ˚F	Compressor Operating Mode	Test Objective
Off-cycle Fan Power	35	<50	-	-	-	Compressor Off	Measure fan input power during compressor off cycle, $\dot{EF}_{comp,off}$
Refrigeration Capacity, Ambient Condition A	35	<50	25	105	9	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{mix,rack}$

Note:
1. Superheat shall be set according to equipment specification in equipment or installation manual, if no superheat specification is given a default superheat value of 6.5 °F shall be used. The superheat setting used in the test shall be reported as part of standard rating.
2. Suction Dew Point shall be measured at the Unit Cooler Exit conditions

Table 17. Standard Rating Conditions for Freezer Unit Cooler[1]

Test Title	Unit Cooler Air Entering Dry-bulb, ˚F	Unit Cooler Air Entering Relative Humidity, %	Suction Dew Point Temp[2], ˚F	Liquid Inlet Bubble Point Temperature ˚F	Liquid Inlet Subcooling, ˚F	Compressor Operating Mode	Test Objective
Off-cycle Fan Power	-10	<50	-	-	-	Compressor Off	Measure fan input wattage during compressor off cycle, $\dot{EF}_{comp,off}$
Refrigeration Capacity, Ambient Condition A	-10	<50	-20	105	9	Compressor On	Determine Net Refrigeration Capacity of Unit Cooler, $\dot{q}_{mix,rack}$
Defrost	-10	<50	-	-	-	Compressor Off	Test according to Appendix C Section C10, $\dot{DF}$, $\dot{Q}_{DF}$.

Note:
1. Superheat shall be set according to equipment specification in equipment or installation manual, if no superheat specification is given a default superheat value of 6.5 °F shall be used. The superheat setting used in the test shall be reported as part of standard rating.
2. Suction Dew Point shall be measured at the Unit Cooler Exit conditions

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Section 6. Calculation for Walk-in Box Load

6.1 *General Description.* The Walk-in Box Load is comprised of a High Load Period ($\dot{BLH}$) of the day corresponding to frequent door openings, product loading events, and other design Load Factors, and a Low Load Period of the day ($\dot{BLL}$) corresponding to the minimum load resulting from conduction, internal heat gains from equipment that is not related to the Refrigeration System, and infiltration when the door is closed. Both the $\dot{BLH}$ and $\dot{BLL}$ are defined as a linear relationship with outdoor ambient temperature. This relationship accounts for the influence of outdoor ambient on the conduction and infiltration loads for a "typical" walk-in box. The High Load Period for $\dot{BLH}$ is 8 hours per day or 1/3 of the operating hours, and the Low Load Period for $\dot{BLL}$ is 16 hours per day or 2/3 of the operating hours.

Note: The $\dot{BLH}$ and $\dot{BLL}$ equations established in this section are subsequently used in Section 7 as a part of the Annual Walk-in Energy Factor (AWEF) calculations.

6.2 *WICF Load Equations*

6.2.1 *Indoor Cooler and Freezer Dedicated Condensing Unit or Matched-pair.* The walk-in box and the Dedicated Condensing Unit are both located within a conditioned space. The Walk-in Box Load during a High Load Period is calculated using Equation 1.

$$\dot{BLH} = \begin{cases} 0.7 \cdot \dot{q}_{ss,ID} & \text{for coolers} \\ 0.8 \cdot \dot{q}_{ss,ID} & \text{for freezers} \end{cases} \quad (1)$$

In which, the High Box Load equals 70% of the Refrigeration System Steady-state net capacity at the design point of 90˚F for coolers and 80% of this capacity for freezers. The Net Refrigeration Capacity shall be measured directly from the test, per the procedure defined in the Section 4 of this standard for coolers and Section 5 for freezers.

For coolers, the Walk-in Box Load during a Low Load Period equals 10% of the Refrigeration System Steady-state net capacity at the design point of 90˚F; for freezers, it equals 40% of this capacity. The Low Box Load can therefore be calculated using Equation 2.

$$\dot{BLL} = \begin{cases} 0.1 \cdot \dot{q}_{ss,ID} & \text{for coolers} \\ 0.4 \cdot \dot{q}_{ss,ID} & \text{for freezers} \end{cases} \quad (2)$$

Note: $\dot{BLH}$ and $\dot{BLL}$ in Equations 1 and 2 are the Walk-in Box Loads during High and Low Load Periods for a refrigerator or freezer indoor Dedicated Condensing Unit. Section 6.2.2 calculates $\dot{BLH}$ and $\dot{BLL}$ for a refrigerator or freezer outdoor Dedicated Condensing Unit.

6.2.2 *Outdoor Cooler and Freezer Dedicated Condensing Unit.* The Walk-in Box Load at different bin temperatures (t_j) during High and Low Load Periods are calculated in Equations 3 and 4.

$$\dot{BLH}(t_j) = \begin{cases} 0.65 \cdot \dot{q}_{ss,A} + 0.05 \cdot \frac{\dot{q}_{ss,A} \cdot (t_j - 35)}{60} & \text{for coolers} \\ 0.55 \cdot \dot{q}_{ss,A} + 0.25 \cdot \frac{\dot{q}_{ss,A} \cdot (t_j + 10)}{105} & \text{for freezers} \end{cases} \quad (3)$$

$$\dot{BLL}(t_j) = \begin{cases} 0.03 \cdot \dot{q}_{ss,A} + 0.07 \cdot \frac{\dot{q}_{ss,A} \cdot (t_j - 35)}{60} & \text{for coolers} \\ 0.15 \cdot \dot{q}_{ss,A} + 0.25 \cdot \frac{\dot{q}_{ss,A} \cdot (t_j + 10)}{105} & \text{for freezers} \end{cases} \quad (4)$$

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Section 7. Calculation for Annual Walk-in Energy Factor (AWEF)

7.1 *General Description.* This section contains methods to calculate AWEF, based on performance data obtained from testing at the Standard Rating Conditions defined in Section 5, for the following walk-in configurations:

7.1.1 Matched-pairs and single-package systems with single capacity compressor and outdoor Dedicated Condensing Unit (Section 7.4)

7.1.2 Matched-pairs and single-package systems with two-capacity compressor and outdoor Dedicated Condensing Unit (Section 7.5)

7.1.3 Matched-pairs and single-package systems with variable capacity compressor and outdoor Dedicated Condensing Unit (Section 7.6)

7.1.4 Matched-pairs and single-package systems with single capacity compressor and indoor Dedicated Condensing Unit (Section 7.7)

7.1.5 Unit Coolers tested alone (Section 7.8)

7.1.6 Fixed capacity Dedicated Condensing Units tested alone (Section 7.9)

For systems with outdoor Dedicated Condensing Units, the AWEF is calculated by weighting system performance at individual bins temperature by bin hours (i.e., the number of hours for a given temperature occurs over the year), as defined in Appendix D. For systems with indoor Dedicated Condensing Units, the AWEF is calculated based on tested system capacity and power at a single ambient condition. For Unit Coolers tested alone, AWEF is calculated using an EER lookup table, where EER is selected based on suction dew point temperature.

7.2 The Total Walk-in System Heat Load includes the Walk-in Box Load ($\dot{BLH}$ and $\dot{BLL}$), defined in Section 6, and the heat load contributed by the operation of the Refrigeration System (i.e., evaporator fan power and defrost cycle). The Total Walk-in System Heat Load is also comprised of a High Load Period ($\dot{WLH}$) and a Low Load Period ($\dot{WLL}$), corresponding to the Walk-in Box Loads $\dot{BLH}$ and $\dot{BLL}$. The Refrigeration System operates 8 hours (or 1/3 of operating hours) under High Load Period, and 16 hours (or 2/3 of operating time) during Low Load Period as defined in Section 6.1.

7.3 Load Factor is defined as the ratio of the Total Walk-in System Heat Load to the system Net Refrigeration Capacity. The Load Factors during High and Low Load Periods at each bin temperature can be calculated using Equations 5 and 6.

$$LFH(t_j) = \frac{\dot{WLH}(t_j)}{\dot{q}_{ss}(t_j)} \quad (5)$$

$$LFL(t_j) = \frac{\dot{WLL}(t_j)}{\dot{q}_{ss}(t_j)} \quad (6)$$

7.4 *Calculation of AWEF for Matched-pairs and Single-package Systems with Single Capacity Compressor and Outdoor Dedicated Condensing Unit.*

7.4.1 The operation of units with single capacity compressors is illustrated in Figure 1. The Total Walk-in System Heat Loads at each bin temperature during High and Low Load Periods for the walk-in unit with single capacity compressor are calculated by the following equations. The terms of defrost cycle power contributing to the box load, $\dot{Q}_{DF}$, and to the system power consumption, $\dot{DF}$, in these equations shall only be applied to the walk-in freezer systems, and shall be set to zero during the calculation for the walk-in refrigerator systems.

$$\dot{WLH}(t_j) = \dot{BLH}(t_j) + 3.412 \cdot \dot{EF}_{comp,off} \cdot \left(1 - LFH(t_j)\right) + \dot{Q}_{DF} \quad (7)$$

$$\dot{WLL}(t_j) = \dot{BLL}(t_j) + 3.412 \cdot \dot{EF}_{comp,off} \cdot \left(1 - LFL(t_j)\right) + \dot{Q}_{DF} \quad (8)$$

Documents
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Full document details: AHRI Standard 1250-2020 - Performance Rating of Walk-in Coolers and Freezers