AHRI Standard 1600-2024 (I-P)

Performance Rating of Unitary Air-conditioning and Air-source Heat Pump Equipment

AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE

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ICS Code: 23.120

Note:

This is a new standard.

AHRI 210/240-2023 (2020), first published in May 2020, establishes a method to rate residential central air-conditioners and heat pumps consistent with the test procedure codified in 10 CFR part 430, subpart B, appendix M1. The energy efficiency metrics, expressed in terms of Seasonal Cooling and Off-mode Rated Efficiency (SCORE), Energy Efficiency Ratio (EER), and Seasonal Heating and Off-mode Rated Efficiency (SHORE), are required for representations coincident with the compliance date of the new efficiency standards in the United States starting at a future date.

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FOREWORD

After the US Department of Energy (DOE) issued a Request for Information to address potential changes to the federal test procedure (88 FR 4091, January 23, 2023), a working group of many stakeholders (including but not limited to AHRI members, independent laboratories, energy advocates and DOE consultants) met periodically over the course of several months to evaluate necessary changes and improvements in language. The result was development of major revisions to AHRI 210/240 (applicable in 2024 or 2025) as well as an entirely new standard (AHRI 1600, to be effective at a later date).

In addition to general clean up items, significant/major changes from the prior version of AHRI 210/240 include the following:

- Modifying several definitions for clarification and adding several new definitions to align with newer technologies. This includes definitions for cold-climate heat pumps, digital compressors, etc.
- Adding a Controls Verification Procedure (CVP, see Appendix I) to validate that a variable capacity unit operates under its own (native) controls in a truly variable fashion, including a rating procedure if it is found that the unit behaves more like a single stage or two capacity unit, and to evaluate a variable capacity unit's full and low capacity operation under its own (native) controls in cooling and (if applicable) heating modes.
- A new test method to validate cut-in and cut-out temperatures for operation (See Appendix J)
- A new metric for heat pumps, COP_{Peak}, (see Appendix K) will help delineate heat pumps that have good low temperature operation.
- A new metric for dual-fuel systems (a heat pump applied with a gas-furnace), DFUE (see Appendix L) that is expected to help promote heat pump adoption.
- A definition and provisions for testing low-static single-split blower-coil systems.

The long-term standard, AHRI 1600, includes all the modifications noted above to AHRI 210/240, and additionally includes the following:

- Extending the seasonal efficiency metric approach, which already is structured as "total seasonal conditioning delivered divided by total seasonal energy use" to include off-mode power consumption so that all energy consumed by a unit is captured in cooling season metric for air-conditioners and in the combination of the cooling and heating season metrics for air-conditioning heat pumps, rather than using a separate off-mode metric. For this very significant change, the terminology of the seasonal metrics are being modified as follows:
  - SEER2 is replaced by SCORE (**S**easonal **C**ooling and **O**ff-mode **R**ated **E**fficiency)
  - HSPF2 is replaced by SHORE (**S**easonal **H**eating and **O**ff-mode **R**ated **E**fficiency)
- For the heating mode, added a cold climate option for SHORE.
- Updated bin weights and cooling load line to replace those that had been in use for nearly six decades. Modest update to the heating load line to replace the load line incorporated in AHRI 210/240-2023. These new bin weights are based on weather data and population weighting from recent years.
- Modified demand defrost credit calculation, added a defrost debit for usage of electric heat during defrost, and added a defrost debit for usage of electric heat after defrost.
- Modification of default indoor blower power consumption, to be more representative of the expected install-base of furnaces, at both full-load and part-load airflow rates. Also reduced the "floor" for part-load airflow from 75% to 65% due to the prevalence of ECM motors.
- Added back in, and expanded, an airflow limitation that had been removed. Full-load airflow rate maximum of 450 scfm/ton will be applicable for all products, not just ducted systems. A part-load airflow rate maximum of 600 scfm/ton will also apply to all products.

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Standards Technical Committee Scope:

The Unitary Small Equipment (USE) Standards Technical Committee is responsible for the development and maintenance of AHRI standards and guidelines pertaining to Unitary Air-Conditioning and Air-source Heat Pump Equipment, Mini-Split (1:1) Air-Conditioning and Heat Pump Equipment, and Demand Response through Variable Capacity HVAC Systems in Residential and Small Commercial Applications

The following product types are out of scope for this STC: Packaged Terminal AC/HP, Commercial or Industrial AC/HP, Furnaces, Variable Refrigerant Systems (VRF), Geothermal and Water Source HP, Single Package Vertical Unit (SPVU), and Performance Rating of Zoning products.

For product definitions refer to the AHRI website sector pages.

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TABLE OF CONTENTS

SECTION		PAGE
Section 1.	Purpose	1
Section 2.	Scope	1
Section 3.	Definitions and Acronyms	1
Section 4.	Classifications	12
Section 5.	Test Requirements	16
Section 6.	Rating Requirements	20
Section 7.	Minimum Data Requirements for Published Ratings	40
Section 8.	Operating Requirements	40
Section 9.	Marking and Nameplate Data	44
Section 10.	Conformance Conditions	44
Section 11.	Calculations	44
Section 12.	Symbols, Subscripts, and Superscripts	86

TABLES

Table 1.	Classification of Unitary Air-conditioners	13
Table 2.	Classification of Unitary Air-source Heat Pumps	14
Table 3.	Classification of Multi-split Systems	16
Table 4.	Refrigerant Line Length Correction Factors	18
Table 5.	Test Condition Tolerance for Charging Hierarchy	19
Table 6.	Informative Guidance for Using AHRI Standard 210/240	22
Table 7.	Required Tests	23
Table 8.	Test Conditions	24

Documents
Document Sharing Hub

Full document details: AHRI Standard 1600-2024 (I-P) - Performance Rating of Unitary Air-conditioning and Air-source Heat Pump Equipment Appendix Lis r...

TABLES (Cont'd)

Table 9. Values of Standard Capacity Ratings 25

Table 10. Minimum ESP for Ducted Systems Tested with an Indoor AMS Installed 29

Table 11. Application Rating Conditions for I-P Standards 36

Table 12. t Statistic 38

Table 13. Operational Mode Tests 41

Table 14. Operational Mode Test Conditions 41

Table 15. Cooling Conditioning Hours and Shoulder Season Hours 51

Table 16. Determination of Standby Power Operating Hours in Cooling Mode 59

Table 17. Defrost-Related Seasonal Heating Efficiency Adjustment Factors 61

Table 18. Heating Conditioning Hours and Shoulder Season Hours 62

Table 19. Determination of Standby Power Operating Hours in Heating Mode 85

Table 20. X_j Values for Auxiliary Power in Heating Mode 86

FIGURES

Figure 1. Voltage Tolerance Test Power Interrupt Procedure 42

Figure 2. Schematic of a Single Stage System Operation in the Cooling Mode 53

Figure 3. Schematic of a Two-capacity System Operation in the Cooling Mode 54

Figure 4. Schematic of a Variable Capacity System Operation in the Cooling Mode 56

Figure 5. Schematic of a Single Stage Heat Pump Operation in Heating Mode 63

Figure 6. Schematic of a Two-capacity Heat Pump Operation in Heating Mode 68

Figure 7. Schematic of a Variable Capacity Heat Pump Operation in Heating Mode 73

APPENDICES

Appendix A. References – Normative 92

Appendix B. References – Informative 94

Documents
Document Sharing Hub

Full document details: AHRI Standard 1600-2024 (I-P) - Performance Rating of Unitary Air-conditioning and Air-source Heat Pump Equipment Appendix Lis r...

Appendix C. Secondary Capacity Check Requirements - Normative 95

Appendix D. ANSI/ASHRAE Standard 37-2009 Clarifications/Exceptions – Normative.....102

Appendix E. ANSI/ASHRAE Standard 116-2010 Clarifications/Exceptions – Normative.....116

Appendix F. Unit Configuration for Standard Efficiency Determination - Normative 124

Appendix G. Determination of Average Power of Auxiliary Components - Normative 129

Appendix H. Verification Testing - Normative.....133

Appendix I. Controls Verification Procedure - Normative.....134

Appendix J. Determination of Cut-in and Cut-out Temperatures - Normative 143

Appendix K. Peak Load Coefficient of Performance - Normative.....145

Appendix L. Dual Fuel System Seasonal Efficiency Metrics – Normative.....146

FIGURES FOR APPENDICES

Figure D1. Example Outlet Duct Elbow Arrangement 104

Figure D2. Example Outlet Plenum Box Arrangement for a Ductless Indoor Unit.....105

Figure D3. Configurations for Manifolding the Static Pressure Taps 108

Figure D4. Typical Air Sampling Tree.....112

Figure D5. Aspirating Psychrometer.....113

Figure I1. Simulated Thermostat Operation (Informative).....135

Figure I2. Graphical Representation of Cooling CVP (Informative).....137

Figure I3. Graphical Representation of Heating CVP (Informative).....139

TABLES FOR APPENDICES

Table D1. Pressure Measurement Location.....110

Table F1. Test Procedures and Reference Motor Efficiency 127

Table F2. BLDC Motor and ECM – Fractional hp – Reference Efficiencies.....128

Documents
Document Sharing Hub

Full document details: AHRI Standard 1600-2024 (I-P) - Performance Rating of Unitary Air-conditioning and Air-source Heat Pump Equipment Appendix Lis r...

Table H1. Acceptance Criteria 133

Table I1. Simulated Thermostat Operation 134

Documents
Document Sharing Hub

Full document details: AHRI Standard 1600-2024 (I-P) - Performance Rating of Unitary Air-conditioning and Air-source Heat Pump Equipment Appendix Lis r...

PERFORMANCE RATING OF UNITARY AIR-CONDITIONING AND AIR-SOURCE HEAT PUMP EQUIPMENT

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish the following for *unitary air-conditioners* and *unitary air-source heat pumps*: definitions, classifications, test requirements, rating requirements, operating requirements, minimum data requirements for *published ratings*, marking and nameplate data, and conformance conditions.

1.1.1 *Intent.* This standard is intended for the guidance of the industry, including manufacturers, engineers, 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 factory-made *unitary air-conditioners* and *unitary air-source heat pumps* with capacities less than 65,000 Btu/h as defined in Section 3.

2.1.1 *Energy Source.* This standard applies only to electrically operated, vapor compression refrigeration systems.

2.2 *Exclusions.* This standard does not apply to the rating and testing of:

2.2.1 Heat operated air-conditioning/*heat pump* equipment.

2.2.2 Packaged Terminal Air-conditioners/Heat Pumps, as defined in AHRI Standard 310/380.CSA C744.

2.2.3 Room air-conditioners/heat pumps.

2.2.4 *Unitary air-conditioners* and *unitary air-source heat pumps* as defined in AHRI Standard 1340 with capacities of 65,000 Btu/h or greater.

2.2.5 Water-source Heat Pumps, Ground Water-source Heat Pumps, or ground-source closed-loop Heat Pumps as defined in ISO/ANSI/ASHRAE/AHRI Standards 13256-1 and 13256-2.

2.2.6 Water heating heat pumps.

2.2.7 Units equipped with desuperheater/water heating devices in operation.

2.2.8 Variable Refrigerant Flow Air-conditioners and Heat Pumps as defined in AHRI Standard 1230 with capacities of 65,000 Btu/h and greater.

2.2.9 Single Package Vertical Units as defined in ANSI/AHRI Standard 390.

Section 3. Definitions and Acronyms

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. Further definitions are found in Appendices C, D and E. For reference purposes, the user of this standard is informed there are also pertinent definitions in Title 10, *Code of Federal Regulations*, Part 430, Subpart 430.2. Throughout the standard defined terms are capitalized.

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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.

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 *Airflow-control Setting(s).* Programmed or wired control system configurations that control a fan to achieve discrete, differing ranges of airflow—often designated for performing a specific function (e.g., cooling, heating, or constant circulation)—without manual adjustment other than interaction with a user-operable control (i.e., a thermostat) that meets the manufacturer specifications for installed-use. For the purposes of this standard, manufacturer specifications for installed-use are those found in the product literature shipped with the unit.

3.2.2 *Airflow Prevention Device.* A device that prevents airflow via natural convection by mechanical means, such as an air *damper box*, or by means of changes in duct height, such as an upturned duct.

3.2.3 *Air Moving System (AMS).*

3.2.3.1 *Constant-volume AMS.* A fan system that varies its operating speed to provide a fixed air-volume-rate from a *ducted system*.

3.2.3.2 *Constant-torque AMS.* A fan system that maintains constant motor shaft torque over a broad range of loads.

3.2.3.3 *Permanent Split Capacitor (PSC) AMS*. A fan system connected to an induction motor that develops motor shaft torque proportional to the RPM slip from synchronous speed.

3.2.4 *Approach Temperature.* The refrigerant temperature at the outdoor liquid service port minus the outdoor ambient temperature.

3.2.5 *Blower Coil System.* A *split system* that includes one or more *blower coil indoor units*.

3.2.6 *Ceiling-mount Blower Coil System.* A ducted *split system* for which all of the following apply:

3.2.6.1 The *outdoor unit* has a *specified* cooling capacity less than or equal to 36,000 Btu/h.
3.2.6.2 The *indoor unit(s)* is/are shipped with *installation instructions* that specify to secure the *indoor unit* only to the ceiling, within a furred-down space, or above a dropped ceiling of the conditioned space, with return air directly to the bottom of the unit without ductwork, or through the furred-down space, or optional insulated return air plenum that is shipped with the *indoor unit*.
3.2.6.3 The installed height of the *indoor unit* is no more than 12 inches (not including condensate drain lines) and the installed depth (in the direction of airflow) of the *indoor unit* is no more than 30 inches.
3.2.6.4 Supply air is discharged horizontally.

3.2.7 *Coefficient of Performance (COP).* A ratio of the cooling/heating capacity in watts to the power input values in watts at any given set of *rating conditions* expressed in watt/watt (a dimensionless quantity).

3.2.7.1 *Coefficient of Performance (COP).* For heating *COP*, supplemental resistance heat is excluded. See Equations 11.51, 11.54, and 11.53.

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3.2.7.2 *Peak Load Coefficient of Performance (COP_{Peak}).* The *coefficient of performance* when meeting the building load at 5°F, calculated in accordance with Appendix K.

3.2.8 *Coil-only System (Coil-only Air-conditioner or Coil-only Heat Pump).* A system that includes only (one or more) *coil-only indoor units*.

3.2.9 *Cold Climate Heat Pump*. A *heat pump* for which both low-temperature compressor cut-out and cut-in temperatures are *specified* to be less than 5°F and for which capacity for the $H4_{full}$ test (at 5ºF) is certified to be at least 70% of the capacity for the nominal full capacity test conducted at 47ºF ($H1_{Full}$ or $H1_{Nom}$).

3.2.10 *Controls Verification Procedure (CVP).* The procedure outlined in Appendix I of this standard that validates *native control* operation, including determination of a *variable capacity system* and demonstration of operating parameters used in the regulatory tests.

3.2.11 *Crankcase Heater*. Any electrically powered device or mechanism for intentionally generating heat within and/or around the compressor sump volume. Crankcase heater control may be achieved using a timer or may be based on a change in temperature or some other measurable parameter, such that the *crankcase heater* is not required to operate continuously. A *crankcase heater* without controls operates continuously when the compressor is not operating.

3.2.12 *Cyclic Test.* A test where the unit's compressor is cycled on and off for specific time intervals. A *cyclic test* provides half the information needed to calculate a *degradation coefficient*.

3.2.13 *Defrost Control System.*

3.2.13.1 *Demand-defrost Control System*. A system that defrosts the *heat pump outdoor coil* only when measuring a predetermined degradation of performance. The *heat pump's* controls shall do one of the following:

3.2.13.1.1 Monitor one or more parameters that always vary with the amount of frost accumulated on the *outdoor coil* (*e.g.*, coil to air differential temperature, coil differential air pressure, outdoor fan power or current, optical sensors, etc.) at least once for every ten minutes of compressor ON-time when space heating.

3.2.13.1.2 Operate as a feedback system that measures the length of the defrost period and adjusts defrost frequency accordingly. In all cases, when the frost parameter(s) reaches a predetermined value, the system initiates a defrost. In a Demand-defrost Control System, defrosts are terminated based on monitoring a parameter(s) that indicates that frost has been eliminated from the coil. A Demand-defrost Control System, which otherwise meets the above requirements, shall allow time-initiated defrosts if, and only if, such defrosts occur after 6 hours of compressor operating time.

Note: Systems that vary defrost intervals according to outdoor dry-bulb temperature are not *demand-defrost control systems*.

3.2.13.2 *Time Adaptive Defrost Control System*. A *demand-defrost control system* that measures the length of the prior defrost period(s) and uses that information to automatically determine when to initiate the next *defrost cycle*.

3.2.13.3 *Time-temperature Defrost Control System*. A *defrost control system* that initiates or evaluates initiating a *defrost cycle* only when a predetermined cumulative compressor ON-time is obtained. This predetermined ON-time is generally a fixed value (e.g., 30, 45, 90 minutes) although it may vary based on the measured outdoor dry-bulb temperature. The ON-time counter accumulates if controller measurements (e.g., outdoor temperature, evaporator temperature) indicate that frost formation conditions are present, and it is reset/remains at zero at all other times. In one application of the control scheme, a defrost is initiated whenever the counter time equals the predetermined ON-time. The counter is reset when the *defrost cycle* is completed.

In a second application of the control scheme, one or more parameters are measured (*e.g.*, air and/or refrigerant temperatures) at the predetermined, cumulative, compressor ON-time. A defrost is initiated only if the measured parameter(s) falls within a predetermined range. The ON-time counter is reset regardless of whether

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a defrost is initiated. If systems of this second type use cumulative ON-time intervals of 10 minutes or less, then the *heat pump* may qualify as having a *demand-defrost control system*.

3.2.13.4 *Defrost Heat Mode*. A mode of operation in which an indoor heating source controlled by any component of the rated combination (e.g. by the *heat pump*, *heat pump* controls, blower controls, or thermostat) operates for any period of time while the system is defrosting. *Heat pumps* that have the ability to operate the indoor blower during defrost, whether or not that ability is the manufacturer default, are considered to have a *defrost heat mode.*

3.2.13.4.1 *Lockout Limitation.* Rated individual combinations that lock out the operation of all non-*heat pump* indoor heating sources under the control of the rated individual combination during defrost do not have a *defrost heat mode*. Locking out means preventing those heating sources from operating in all cases, with no configuration option to change this behavior.

3.2.13.5 *Defrost Overrun Mode.* A mode of operation in which a rated individual combination that has been operating in a *defrost heat mode*, continues to operate for a period of time following the termination of a defrost. In order to qualify as having a *defrost overrun mode* rated individual combinations must first have a *defrost heat mode.*

3.2.14 *Degradation Coefficient (C_D).* A parameter used in calculating the *part load factor*, which is a measure of the efficiency loss due to the cycling of the units. The *degradation coefficient* for cooling is denoted by $\boldsymbol{C_D^c}$. The *degradation coefficient* for heating is denoted by $\boldsymbol{C_D^h}$.

3.2.15 *Digital Compressor.* A compressor that mechanically modulates output using a duty cycle. Where speed is used in this standard, modulation may be substituted for *digital compressors*.

3.2.15.1 *Boost Compressor Modulation (Boost)*. A modulation faster than *full compressor stage*, as *specified* by the manufacturer, at which the unit operates to achieve increased capacity. The *boost compressor stage* for heating mode tests can be the same or different from the cooling mode value. Also applies to *triple-capacity, northern heat pumps*.

3.2.15.2 *Full Compressor Modulation (Full)*. The operational modulation as *specified* by the manufacturer at which the unit operates at full load test conditions. The *full compressor modulation* for heating mode tests can be the same or different from the cooling mode value.

3.2.15.3 *Intermediate Compressor Modulation (Int)*.

3.2.15.3.1 *For Multi-split Systems*. A modulation as *specified* by the manufacturer that is (a) greater than or equal to the sum of the minimum modulation and one-fourth of the difference between the *low compressor modulation* and *full compressor modulation* and (b) less than or equal to the sum of the minimum modulation and three-fourths of the difference between *low compressor modulation* and *full compressor modulation*. The compressor modulations for cooling and heating modes are calculated separately.

3.2.15.3.2 *For All Other Variable Capacity Systems*. *low compressor modulation* plus one-third of the difference between *low compressor modulation* and *full compressor modulation* with a tolerance of plus 5% or the next higher modulation step.

3.2.15.4 *Low Compressor Modulation (Low)*. The modulation as *specified* by the manufacturer at which the unit operates at low load test conditions. The *low compressor modulation* for heating mode tests can be the same or different from the cooling mode value.

3.2.16 *Double-duct System.* Air-cooled commercial package air-conditioning and heating equipment that is either a) a horizontal *single package unit* or *split system*, or b) a vertical unit that consists of two components that are shipped or installed either connected or split; and is intended for indoor installation with ducting of outdoor air from the building exterior to and from the unit, where the unit and/or all of its components are non-weatherized and are not marked (or listed) as being in compliance with UL 1995/CSA C22.2 No.236, UL60335-2-40 (C22.2), or equivalent requirements for outdoor use.

- If it is a horizontal unit, the complete unit shall have a maximum height of 35 in or the unit shall have components that do not exceed a maximum height of 35 in.

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- If it is a vertical unit, the complete (split, connected, or assembled) unit shall have components that do not exceed maximum depth of 35 in; and, a *specified* cooling capacity less than 65,000 Btu/h.

3.2.17 *Ducted System (Ducted Air-conditioner or Ducted Heat Pump)*. An *air-conditioner* or *heat pump* that is designed to be permanently installed and delivers conditioned air to the indoor space through a duct(s). The *air-conditioner* or *heat pump* may be either a *split system* or a *single package unit*.

3.2.18 *Energy Efficiency Ratio (EER)*. A ratio of the cooling capacity in Btu/h to the *total power* in watts at any given set of *rating conditions* expressed in Btu/(W×h).

3.2.18.1 $EER_{A,Full}$. The *EER* at A_{Full} test conditions.

3.2.19 *Evaporator coil*. An assembly that absorbs heat from a space and transfers the heat to a refrigerant. A *split system* indoor coil is the *evaporator coil* in cooling mode.

3.2.20 *Gross Capacity*. The calculated system capacity that results when not accounting for the heat generated from an indoor supply fan.

3.2.21 *Heat Comfort Controller*. A *heat pump* control that regulates the operation of the electric resistance elements to assure that the air temperature leaving the indoor section does not fall below a *specified* temperature even if the *heat pump* capacity exceeds the building load. This *specified* temperature can be field adjustable and the temperature is *specified* by the manufacturer as part of the equipment rating.

Note: *Heat pumps* that actively regulate the rate of electric resistance heating when operating below the balance point (as the result of a second stage call from the thermostat) but do not operate to maintain a minimum delivery temperature are not considered as having a *heat comfort controller*.

3.2.22 *Heating Season.* The months of the year that require heating, *e.g.*, typically, and roughly, October through April for the northern hemisphere.

3.2.23 *Independent Coil Manufacturer (ICM)*. A company that manufactures *indoor units* but does not manufacture *single package units* or *outdoor units*.

3.2.24 *Indoor Unit*. A separate assembly of a *split system* that includes both an arrangement of refrigerant-to-air heat transfer coil(s) for transfer of heat between the refrigerant and the indoor air and a condensate drain pan. An *indoor unit* may or may not include sheet metal or plastic parts not part of external cabinetry to direct/route airflow over the coil(s), a cooling mode expansion device, external cabinetry, and an integrated indoor blower (i.e. a device to move air including its associated motor). A separate designated air mover that may be a furnace or a *modular blower* may be considered to be part of the *indoor unit*. A *service coil* is not an *indoor unit*.

3.2.24.1 *Blower Coil Indoor Unit*. An *indoor unit* with either a) an indoor blower housed with the coil or b) a separate designated air mover such as a furnace or *modular blower*.

3.2.24.2 *Air Handler*. An arrangement of refrigerant-to-air heat transfer coil(s), condensate drain pan, sheet metal or plastic parts to direct/route airflow over the coil(s), air moving device, and external cabinetry. An Air Handler may or may not include a cooling mode expansion device and/or supplemental resistance heating elements.

3.2.24.3 *Modular Blower*. A product which only uses single-phase electric current, and which meets all of the following:

3.2.24.3.1 Is designed to be the principal air circulation source for the living space of a residence.
3.2.24.3.2 Is not contained within the same cabinet as a furnace or *central air-conditioner*.
3.2.24.3.3 Is designed to be paired with HVAC products that have a heat input rate of less than 225,000 Btu per hour and cooling capacity less than 65,000 Btu per hour.

3.2.24.4 *Coil-only Indoor Unit*. An *indoor unit* that is distributed in commerce without an indoor blower or separate designated air mover. A *coil-only indoor unit* installed in the field relies on a separately-installed furnace or a *modular blower* for indoor air movement.

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3.2.24.4.1 *Cased Coil*. A *coil-only indoor unit* with external cabinetry.
3.2.24.4.2 *Uncased Coil*. A *coil-only indoor unit* without external cabinetry.

3.2.24.5 *Service Coil*. An arrangement of refrigerant-to-air heat transfer coil(s), condensate drain pan, sheet metal or plastic parts to direct/route airflow over the coil(s), sold specifically for the intent of replacing an *uncased coil* or *cased coil* that has already been placed into service, and that has been labeled "for indoor coil replacement only" on the nameplate and in manufacturer technical and product literature. The model number for any *service coil* shall include some mechanism (e.g., an additional letter or number) for differentiating a *service coil* from a coil intended for an *indoor unit*. A *service coil* may or may not include external cabinetry and/or a cooling mode expansion device.

3.2.25 *Installation Instructions.* Manufacturer's documentation that come packaged with or appear in the labels applied to the unit. This does not include online manual.

3.2.26 *Latent Cooling Capacity*. The rate, expressed in Btu/h, at which the equipment removes latent heat (reduces the moisture content) of the air passing through it under standard conditions of operation.

3.2.27 *Low-static Blower Coil System.* A ducted *multi-split system* or ducted *multi-head mini-split system* for which all *indoor units* produce greater than 0.01 in H_2O and a maximum of 0.35 in H_2O ESP when operated at the *specified* cooling full-load airflow not exceeding 400 scfm per *specified* ton of cooling.

3.2.28 *Low-static Single-split Blower Coil System.* A ducted *single-split system air-conditioner* or *ducted single-split heat pump* for which all of the following apply:

3.2.28.1 The *outdoor unit* has a *specified* cooling capacity less than or equal to 24,000 Btu/h;

3.2.28.2 If the *outdoor unit* is a *heat pump* or a *variable capacity air-conditioner,* is separately *specified* with a *blower coil indoor unit* tested with a minimum 0.5 in H_2O ESP, otherwise it is separately *specified* with a *coil-only indoor unit*; and

3.2.28.3 The *indoor unit* is marketed for and produces a maximum ESP less than 0.5 in H_2O when operated at the *specified* cooling full-load airflow not exceeding 400 scfm per *specified* ton of cooling.

3.2.29 *Mandatory Constant Circulation System*. An *air-conditioner* or *heat pump* that is required to operate the indoor fan continuously when power is applied to the unit regardless of control settings.

3.2.30 *Mid-static Blower Coil System.* A ducted *multi-split system* or *multi-head mini-split system* for which all *indoor units* produce greater than 0.20 in H_2O and a maximum of 0.65 in H_2O ESP when operated at the *specified* cooling full-load airflow not exceeding 400 scfm per *specified* ton of cooling.

3.2.31 *Minimum-speed-limiting Variable-speed Heat Pump.* A *heat pump* for which the minimum compressor speed (represented by revolutions per minute or motor power input frequency) is higher than its minimum value for operation in a 47°F ambient temperature for any bin temperature t_j for which the calculated heating load is less than the calculated intermediate-speed capacity.

3.2.32 *Mobile Home Blower Coil System.* A *split system* that contains an *outdoor unit* and an *indoor unit* that meet the following criteria:

3.2.32.1 Both the *indoor unit* and *outdoor unit* are shipped with *installation instructions* that stipulate installation only in a mobile home with the home and equipment complying with HUD Manufactured Home Construction Safety Standard 24 CFR part 3280;
3.2.32.2 The *indoor unit* cannot exceed 0.40 in H_2O when operated at the cooling full-load airflow not exceeding 400 cfm per *specified* ton of cooling; and

3.2.32.3 The *indoor unit* and *outdoor unit* each must bear a label in at least 1⁄4 in font that reads "For installation only in HUD manufactured home per Construction Safety Standard 24 CFR part 3280."

3.2.33 *Mobile Home Coil-only System.* A *coil-only system* that includes an *outdoor unit* and *coil-only indoor unit* that meet the following criteria:

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3.2.33.1 The *outdoor unit* is shipped with *installation instructions* that stipulate installation only for mobile homes that comply with HUD Manufactured Home Construction Safety Standard 24 CFR part 3280;

3.2.33.2 The *coil-only indoor unit* is shipped with *installation instructions* that stipulate installation only in or with a mobile home furnace, *modular blower*, or designated air mover that complies with HUD Manufactured Home Construction Safety Standard 24 CFR part 3280, and has dimensions no greater than 20 in wide, 34 in high and 21 in deep; and

3.2.33.3 The *coil-only indoor unit* and *outdoor unit* each has a label in at least 1⁄4 in font that reads 'For installation only in HUD manufactured home per Construction Safety Standard 24 CFR part 3280."

3.2.34 *Multiple-circuit (or Multi-circuit) System.* A *split system* that has one *outdoor unit* and that has two or more *indoor units* installed on two or more refrigeration circuits such that each refrigeration circuit serves a compressor and one and only one *indoor unit*, and refrigerant is not shared from circuit to circuit.

3.2.35 *Native Control*. The configuration of a unit under test to operate with settings *specified* for field use and to avoid all regulatory test overrides.

3.2.36 *Net Capacity*. The calculated system capacity that results when accounting for the heat generated from an indoor supply fan.

3.2.37 *Nominal Cooling Capacity*. A capacity approximately equal to the *air-conditioner* cooling capacity tested at A_{full} condition. For *indoor units*, the highest cooling capacity listed in published product literature for 95°F outdoor dry-bulb temperature and 80°F dry-bulb, 67°F wet-bulb indoor conditions. For *outdoor units*, the lowest cooling capacity listed in published product literature for these conditions. If incomplete or no operating conditions are published, the highest (for *indoor units*) or lowest (for *outdoor units*) such cooling capacity available for sale shall be used.

3.2.38 *Nominal Heating Capacity*. A capacity approximately equal to the *heat pump* capacity tested at the $H1_{Nom}$ condition.

3.2.39 *Non-ducted Indoor Unit*. An *indoor unit* designed to be permanently installed, mounted to/in ceilings and/or room walls, and/or to floors, and that directly heats or cools air within the conditioned space.

3.2.40 *Non-ducted System*. A *split system* with only *non-ducted indoor unit(s)*. The system components may be of a modular design.

3.2.41 *Non-tested Combination (NTC)*. Any manufacturer approved combination of an *outdoor unit(s)* with one or more *indoor units* whose ratings are based on an *alternative efficiency determination method* (*AEDM*).

3.2.42 *Normalized Gross Indoor Fin Surface (NGIFS).* The gross fin surface area of the indoor coil divided by the cooling capacity measured for the A_{full} test

3.2.43 *Off-mode Power*. The power consumption when the unit is connected to its main power source but is neither providing cooling nor heating to the building it serves.

3.2.44 *Off-mode Season*. For *central air-conditioners* other than *heat pumps*, the *shoulder season* and the entire *heating season*; and for *heat pumps*, the *shoulder season* only.

3.2.45 *Oil Recovery Mode*. An automatic system operation that returns oil to the compressor crank case when the control system determines that the oil level in the *outdoor unit* is low.

3.2.46 *Outdoor Coil*. A heat exchange surface that transfers heat between outdoor air and the refrigerant. The *outdoor coil* may be located internal or external to the building.

3.2.47 *Outdoor Unit*. A separate assembly of a *split system* that transfers heat between the refrigerant and the outdoor air, and consists of an *outdoor coil*, compressor(s), an air moving device, and in addition for *heat pumps*, may include a heating mode expansion device, reversing valve, and/or *defrost control systems*.

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3.2.48 *Outdoor Unit Manufacturer (OUM).* A manufacturer of *single package units*, *outdoor units*, and/or both *indoor units* and *outdoor units*.

3.2.49 *Part Load Factor (PLF).* The ratio of the cyclic *EER* (or *COP* for heating) to the steady state *EER* (or *COP*), where both *EER*s (or *COP*s) are determined based on operation at the same ambient conditions.

3.2.50 *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. 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*.

3.2.50.1 *Application Rating*. A rating based on tests performed at *rating conditions* other than *standard rating conditions*.

3.2.50.2 *Standard Rating*. A rating based on tests performed at *standard rating conditions*.

3.2.51 *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**.**

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

3.2.52 *Seasonal Cooling and Off-Cycle Rated Efficiency (SCORE).* The total heat removed from the conditioned space during the annual cooling season, Btu, divided by the total electrical energy, W·h, consumed during a defined time period, Btu/(W×h).

3.2.53 *Seasonal Heating and Off-cycle Rated Efficiency (SHORE).* The total heat added to the conditioned space during the annual *heating season*, Btu, divided by the total electrical energy, W·h, consumed during a defined time period, Btu/(W×h).

3.2.54 *Sensible Cooling Capacity*. The rate, expressed in Btu/h, at which the equipment lowers the dry-bulb temperature (removes sensible heat) of the air passing through it under standard conditions of operation.

3.2.55 *Shoulder Season.* The months of the year in between those months that require cooling and those months that require heating, *e.g.*, typically, and roughly, April through May, and September through October.

3.2.56 *Single Package Unit (Single Package Air-conditioner or Single Package Heat Pump)*. Any *central air-conditioner* or *heat pump* that has all major assemblies enclosed in one cabinet.

3.2.57 *Single Stage System (Single Stage Air-conditioner, Single Stage Heat Pump, Single Stage Outdoor Unit, or Single-speed).* An *air-conditioner* or *heat pump* that has a single, fixed capacity compressor.

3.2.58 *Small-duct, High-velocity System (SDHV).* A *split system* for which all *indoor units* are *blower coil indoor units* that produce at least 1.2 in H_2O of ESP when operated at the full-load airflow *specified* by the manufacturer of at least 220 scfm per *specified* ton of cooling.

3.2.59 *Space Constrained Product.* A *central air-conditioner* or *heat pump*:

3.2.59.1 that has *specified* cooling capacities no greater than 30,000 Btu/h;

3.2.59.2 that has an *outdoor unit* or *indoor unit* having at least two overall exterior dimensions or an overall displacement that:

3.2.59.2.1 is substantially smaller than those of other units that are:

3.2.59.2.1.1 currently usually installed in site built single family homes; and
3.2.59.2.1.2 of a similar cooling, and, if a *heat pump*, heating capacity; and

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Full document details: AHRI Standard 1600-2024 (I-P) - Performance Rating of Unitary Air-conditioning and Air-source Heat Pump Equipment Appendix Lis r...

3.2.59.2.2 if increased, would certainly result in a considerable increase in the usual cost of installation or would certainly result in a significant loss in the utility of the product to the consumer; and

3.2.59.3 of a product type that was available for purchase in the United States as of December 1, 2000.

3.2.60 *Specified*. Documentation provided by the manufacturer or values determined in the test procedure. In the event of conflicting information, the hierarchy is:

3.2.60.1 Test procedure provisions requiring alternate values (e.g. modified airflow to comply with static)
3.2.60.2 Certification report (information provided to authorities having jurisdiction).
3.2.60.3 *Installation instructions*.
3.2.60.4 Test instructions or test plan provided by the manufacturer.

3.2.61 *Split System (Split System Air-conditioner or Split System Heat Pump)*. Any *central air-conditioner* or *heat pump* that has at least two separate assemblies that are connected with refrigerant piping when installed. At least one of these assemblies is an *indoor unit* and at least one of these assemblies is an *outdoor unit*. *Split systems* may be either *blower coil systems* or *coil-only systems*.

3.2.61.1 *Multi-head Mini-split System*. A *split system* that has one *outdoor unit* and that has two or more *indoor units* connected with a single refrigeration circuit. The *indoor units* operate in unison in response to a single indoor thermostat.

3.2.61.2 *Multi-split System (Multi-split Air-conditioner or Multi-split Heat Pump)*. A *split system* that has one *outdoor unit* and having two or more *indoor units* connected with a single refrigeration circuit. The *indoor units* operate independently and can be used to condition multiple zones in response to at least two indoor thermostats or temperature sensors. The *outdoor unit* operates in response to independent operation of the *indoor units* based on control input of at least two indoor thermostats or temperature sensors, and/or based on refrigeration circuit sensor input.

3.2.61.3 *Single-split System (Single-split Air-conditioner or Single-split Heat Pump)*. A *split system* that has one *outdoor unit* and one *indoor unit* connected with a single refrigeration circuit.

3.2.62 *Standard Air*. Dry air having a mass density of 0.075 lb/ft^3.

3.2.63 *Standard Filter*. The filter with the lowest level of filtration that is distributed in commerce with a model. If the manufacturer does not stipulate which filter option has the lowest level of filtration in *installation instructions* or manufacturer's marketing materials for the model, then the Standard Filter shall be the filter designated as the "default" or "standard" filter in the marketing materials for the model. If the manufacturer does not stipulate a default filter option or which filter option has the lowest filtration level, then the Standard Filter shall be any filter shipped by the manufacturer.

3.2.64 *Steady state Test*. A test where the controlled test parameters are regulated to remain constant within the tolerances identified in the standard while the unit operates continuously in the same mode.

3.2.65 *System Controls*. Devices used for operation of *air-conditioners* and *heat pumps*, which can include but are not limited to the following:

3.2.65.1 An integral network operations and communications system with sensors to monitor the status of items such as temperature, pressure, oil, refrigerant levels and fan speed.

3.2.65.2 A micro-processor, algorithm-based control scheme to: a) communicate with a managed *variable capacity compressor*, fan speed of *indoor units*, fan speed of the *outdoor unit*, solenoids, and various accessories; b) manage metering devices; and c) concurrently operate various parts of the system.

3.2.65.3 Regulate system efficiency and refrigerant flow through an engineered distributed refrigerant system to conduct zoning operations, matching capacity to the load in each of the zones.

3.2.66 *Temperature Bin*. The 5°F increments used to partition the outdoor dry-bulb temperature ranges of the cooling and *heating seasons*.

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3.2.67 *Test Condition Tolerance.* The maximum permissible difference between the average value of the measured test parameter and the test condition identified in the standard.

3.2.68 *Test Operating Tolerance.* The maximum permissible range a measurement may vary over the test interval identified in the standard. When expressed as a percentage, the maximum allowable variation is the percentage identified in the standard of the average value.

3.2.69 *Tested Combination.* A specific combination of an *outdoor unit(s)* with one or more *indoor units* having measured performance in a laboratory.

3.2.69.1 *Single-split Tested Combination.* A specific combination of an *outdoor unit* with either one *indoor unit* or multiple *indoor units* which operate in unison.

3.2.69.2 *Multi-split Tested Combination.* A specific combination of an *outdoor unit* with between two and five *indoor units*.

3.2.70 *Total Cooling Capacity*. The sum of Sensible and *latent cooling capacity* (*net capacity* in the cooling mode) the equipment can remove from the conditioned space in a defined interval of time in Btu/h.

3.2.71 *Total Heating Capacity*. The amount of Sensible Capacity (*net capacity* in the heating mode) the equipment can add to the conditioned space in a defined interval of time in Btu/h

3.2.72 *Total Power*. The sum of the power consumed by all components of a system, including the power consumed by the compressor(s), indoor supply fan motor(s), outdoor condenser fan motor(s), *system controls*, factory installed condensate pumps and other devices required for normal operating modes.

3.2.73 *Triple-capacity, Northern Heat Pump.* a *heat pump* that provides two stages of cooling and three stages of heating. The two common stages for both the cooling and heating modes are the low capacity stage and the high capacity stage. The additional heating mode stage is the booster capacity stage, which offers the highest heating capacity output for a given set of ambient operating conditions.

3.2.74 *Two-capacity (or Two-stage) Compressor*. A compressor or group of compressors operating with only two stages of capacity.

3.2.74.1 *Full Compressor Stage (Full Stage or Full).* The staging of compressor(s) as *specified* by the manufacturer at which the unit operates at *full stage*, or full load test conditions. For *variable capacity certified, two-capacity system*, the *full compressor stage* for heating mode tests may be the same or different from the cooling mode value.

3.2.74.2 *Low Compressor Stage (Low Stage or Low).* The staging of compressor(s) as *specified* by the manufacturer at which the unit operates at low load test conditions. For *variable capacity certified, two-capacity system*, the *low compressor stage* for heating mode tests may be the same or different from the cooling mode value.

3.2.75 *Two-capacity Northern Heat Pump*. A *heat pump* that has a factory or field-selectable lock-out feature to prevent space cooling at high-capacity. *Two-capacity heat pumps* having this feature will typically have two sets of ratings, one with the feature disabled and one with the feature enabled. The *heat pump* is a *two-capacity northern heat pump* only when this feature is enabled at all times. The indoor coil model number shall reflect whether the ratings pertain to the lockout enabled option via the inclusion of an extra identifier, such as "+LO". When testing as a *two-capacity, northern heat pump*, the lockout feature shall remain enabled for all tests.

3.2.76 *Two-capacity (or Two-stage) System (Two-stage Air-conditioner or Two-stage Heat Pump).* An *air-conditioner(s)* or *heat pump(s)* that use a *two-capacity compressor* or two *single stage outdoor units* connected to a single *indoor unit*, where each *outdoor unit* can operate independently or jointly.

3.2.77 *Multiple Indoor Blowers (MIB).* A *split system* or *single package unit* which contains multiple indoor blowers where the indoor blowers are designed to cycle on and off independently of one another and are not controlled such that all indoor blowers are modulated to always operate at the same airflow or speed.

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3.2.78 *Unitary Air-conditioner (Air-conditioner, Air-cooled Air-conditioner, Central Air-conditioner).* One or more factory-made assemblies which normally include an indoor coil(s), compressor(s), *outdoor coil(s)*, indoor fan(s), outdoor fan(s), and expansion device(s). When such equipment is provided in more than one assembly, the separated assemblies shall be designed to be used together, and the requirements of rating outlined in the standard are based upon the use of matched assemblies.

3.2.78.1 *Functions*. *Air-conditioners* shall provide the function of air-circulation, air cleaning, cooling with controlled temperature and dehumidification, and may optionally include the function of heating and/or humidifying.

3.2.79 *Unitary Heat Pump (Heat Pump, Air-source Heat Pump, Central Heat Pump).* One or more factory-made assemblies which normally include an indoor conditioning coil(s), compressor(s), *outdoor coil(s)*, indoor fan(s), outdoor fan(s), and expansion device(s) including means to provide a heating function. When such equipment is provided in more than one assembly, the separated assemblies shall be designed to be used together, and the requirements of rating outlined in the standard are based upon the use of matched assemblies.

3.2.79.1 *Functions*. *Heat Pumps* shall provide the function of air heating with controlled temperature, and may include the functions of air-cooling, air-circulating, air-cleaning, dehumidifying, or humidifying.

3.2.79.2 *Heat pump having a Heat Comfort Controller.* A *heat pump* with controls that can regulate the operation of the electric resistance elements to assure that the air temperature leaving the indoor section does not fall below a *specified* temperature. *Heat pumps* that actively regulate the rate of electric resistance heating when operating below the balance point (as the result of a second stage call from the thermostat) but do not operate to maintain a minimum delivery temperature are not considered as having a *heat comfort controller*.

3.2.80 *Variable Capacity Compressor.* A compressor capable of varying its rotational speed in four or more discrete stages or steps, or continuously varying to any level, from low to full using an inverter or variable frequency drive. Alternative to varying rotational speed, other means of varying refrigerant mass flow rate in four or more discrete stages or steps, or continuously to any level, may be used.

3.2.80.1 *Boost Compressor Speed (Boost).* A speed faster than *full compressor speed*, as *specified* by the manufacturer, at which the unit will operate to achieve increased capacity. The *boost compressor speed* for heating mode tests may be the same or different from the cooling mode value. Also applies to *triple-capacity, northern heat pumps*.

3.2.80.2 *Full Compressor Speed (Full).* The speed as *specified* by the manufacturer at which the unit operates at full load test conditions. The *full compressor speed* for heating mode tests may be the same or different from the cooling mode value.

3.2.80.3 *Intermediate Compressor Speed (Int).*

3.2.80.3.1 *For Multi-split Systems*. A speed as *specified* by the manufacturer that is (a) greater than or equal to the sum of the minimum speed and one-fourth of the difference between the *low compressor speed* and *full compressor speed* and (b) less than or equal to the sum of the minimum speed and three-fourths of the difference between *low compressor speed* and *full compressor speed*. The compressor speeds for cooling and heating modes are calculated separately.

3.2.80.3.2 *For All Other Variable Capacity Systems*. *Low compressor speed* plus one-third of the difference between *low compressor speed* and *full compressor speed* with a tolerance of plus 5% or the next higher inverter frequency step.

3.2.80.4 *Low Compressor Speed (Low).* The speed as *specified* by the manufacturer at which the unit operates at low load test conditions. The *low compressor speed* for heating mode tests may be the same or different from the cooling mode value.

3.2.81 *Variable Capacity System (Variable Capacity Air-conditioner or Variable Capacity Heat Pump).* An *air-conditioner* or *heat pump* that has either a) a *variable capacity compressor*, or b) a *digital compressor*, and that controls the system by monitoring system operation and automatically modulating the compressor output, indoor air flow and other system parameters as required in order to maintain the indoor room temperature.

Documents
Document Sharing Hub
Full document details: AHRI Standard 1600-2024 (I-P) - Performance Rating of Unitary Air-conditioning and Air-source Heat Pump Equipment Appendix Lis r...

3.2.81.1 *Variable Capacity Certified, Single-capacity System.* A system that is certified as a *variable capacity system*, but demonstrates *single stage system* behavior during the variable capacity determination *CVP* in Appendix I.

3.2.81.2 *Variable Capacity Certified, Two-capacity System.* A system that is certified as a variable capacity system, but demonstrates *two-capacity system* behavior during the variable capacity determination *CVP* in Appendix I.

3.2.81.3 *Variable Capacity Coil-Only System.* A *split system* that is a *variable capacity system* having only (one or more) *coil-only indoor units*.

3.2.81.4 *Variable Refrigerant Flow (VRF) System.* A *multi-split system* that distributes refrigerant through a piping network to multiple *blower coil indoor units* each capable of individual zone temperature control, through proprietary zone temperature control devices and a common communications network.

Note: Single-phase VRF systems less than 65,000 Btu/h are *central air-conditioners* and *central air conditioning heat pumps*, also referred to as *unitary air-conditioners* and *unitary air-source heat pumps*.

3.2.82 *Virtual Load.* An element of the *CVP* conducted under *native controls*, by which the software that controls the indoor test room conditions (i.e., operates the indoor room reconditioning system) is programmed to mimic the response of a building to space conditioning under a heating or cooling load in real time, by monitoring the capacity of the unit under test and adjusting the indoor room conditions according to the *virtual load* defined by the parameters in Appendix I4. The *virtual load* defines the time-dependent rate of change of the indoor room conditions as a function of the target load and the measured capacity of the tested system.

3.2.83 *Wall-mount Blower Coil System.* A ducted *split system air-conditioner* or ducted *split system heat pump* for which all of the following apply:

3.2.83.1 The *outdoor unit* has a *specified* cooling capacity less than or equal to 36,000 Btu/h.
3.2.83.2 The *indoor unit(s)* is/are shipped with *installation instructions* that stipulate mounting only by:
3.2.83.2.1 Securing the back side of the unit to a wall within the conditioned space, or
3.2.83.2.2 Securing the unit to adjacent wall studs or in an enclosure, such as a closet, such that the *indoor unit's* front face is flush with a wall in the conditioned space.
3.2.83.3 Has front air return without ductwork and is not capable of horizontal air discharge.
3.2.83.4 Has a height no more than 45 in, a depth (perpendicular to the wall) no more than 22 in (including tubing connections), and a width no more than 24 in (parallel to the wall).

3.2.84 *Wet-coil Test.* A cooling mode test conducted at test conditions that typically cause water vapor to condense on the test unit *evaporator coil*.

3.3 *Acronyms.*

3.3.1 *AEDM.* Alternative Efficiency Determination Method.
3.3.2 *AHRI.* Air-Conditioning, Heating, and Refrigeration Institute.
3.3.3 *ASHRAE.* ASHRAE was formed as the American Society of Heating, Refrigerating and Air-Conditioning Engineers by the merger in 1959 of American Society of Heating and Air-Conditioning Engineers (ASHAE) founded in 1894 and The American Society of Refrigerating Engineers (ASRE) founded in 1904.
3.3.4 *CFR.* Code of Federal Regulations.
3.3.5 *ESP.* External Static Pressure.

Section 4. Classifications

4.1 *Classifications.* Equipment covered within the scope of this standard shall be classified as shown in Tables 1, 2 and 3.

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Table 1. Classification of Unitary Air-conditioners

Designation	AHRI Type [1,2]	Arrangement - ID	Arrangement - OD
Single Package Unit	SP-A [5,7]		ELEC HEAT [3] / ID FAN / EVAP; OD FAN or PUMP / COMP / COND
Year-Round *Single Package Unit*	SPY-A [5,7]		GAS HEAT [4] / ID FAN / EVAP; OD FAN or PUMP / COMP / COND
Remote Condenser	RC-A	ID FAN / EVAP / COMP	OD FAN or PUMP / COND
Split System Air-conditioner with Coil-only	RCU-A-C	EVAP	OD FAN or PUMP / COMP / COND
Split System Air-conditioner with Coil Blower	RCU-A-CB [6,7]	ID FAN / EVAP	OD FAN or PUMP / COMP / COND
Year-Round *Split System Air-conditioner* with Coil Blower	RCUY-A-CB [5,6,7]	GAS HEAT [4] / ID FAN / EVAP	OD FAN or PUMP / COMP / COND

Notes:

1. A suffix of "-O" following any of the above classifications indicates a *non-ducted system*.
2. "-A" indicates air-cooled condenser.
3. Optional component.
4. May also be other heat source except for electric strip heat.
5. For *space constrained products*, insert “SCP-” at the beginning, and outdoor arrangement may move from outdoor side to indoor side.
6. For *small-duct, high-velocity system*, insert “SDHV-” at the beginning.
7. For *double-duct system*, append “-DD”, and outdoor arrangement moves from outdoor side to indoor side.

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Table 2. Classification of Unitary Air-source Heat Pumps

Designation	AHRI Type [1,2]	Arrangement - ID	Arrangement - OD
Single Package Unit	HSP-A [5,7]		ELEC HEAT [3] / OD FAN or PUMP ID FAN / COMP EVAP / COND
Year-Round *Single Package Unit*	HSPY-A [5,7]		GAS HEAT [4] / OD FAN or PUMP ID FAN / COMP EVAP / COND
Remote *Outdoor Coil*	HRC-A-CB [7]	ID FAN EVAP COMP	OD FAN or PUMP COND
Remote *Outdoor Coil*, Coil-only	HRC-A-C [7]	EVAP COMP	OD FAN or PUMP COND
Year Round *Split System Heat Pump* with Coil Blower	HRCUY-A-CB	GASHEAT [4] ID FAN EVAP	OD FAN or PUMP COMP COND
Split System Heat Pump with Coil Blower	HRCU-A-CB [6,7]	ELEC HEAT [3] ID FAN EVAP	OD FAN or PUMP COMP COND
Split System Heat Pump with Coil-only	HRCU-A-C [6,7]	EVAP	OD FAN or PUMP COMP COND
Year Round *Split System Heat Pump* with Coil-only	HRCUY-A-C[6,7]	GASHEAT [8] EVAP	OD FAN or PUMP COMP COND

Notes:

1. A suffix of "-O" following any of the above classifications indicates a *non-ducted system*.
2. For Heating Only, change the initial “H” to “HO”
3. Optional component
4. May also be other heat source except for gas heat.
5. For *space constrained products*, insert “SCP-” at the beginning, and outdoor arrangement may move from outdoor side to indoor side.
6. For *small-duct, high-velocity system*, insert “SDHV-” at the beginning.
7. For *double-duct system*, append “-DD”, and outdoor arrangement moves from outdoor side to indoor side.

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8. Not included in the testing

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Table 3. Classification of Multi-split Systems

System Identification / Attribute		*Multi-split System*	Heat Recovery *Multi-split System*
Refrigerant Circuits		One shared to all *indoor units*	One shared to all *indoor units*
Compressors		One or more variable capacity or alternative method resulting in three or more steps of capacity	One or more variable capacity or alternative method resulting in three or more steps of capacity
Indoor Units	Quantity	Greater than one *indoor unit*	Greater than one *indoor unit*
	Operation	Individual Zones/Temperature	Individual Zones/Temperature
Outdoor Units	Quantity	One *outdoor unit* or multiple manifolded *outdoor units* with a specific model number.	One *outdoor unit* or multiple manifolded *outdoor units* with a specific model number.
	Steps of Control	Three or More	Three or More
	Mode of Operation	Cooling, Heating	Cooling, Heating, Heat Recovery
	Heat Exchanger	One or more circuits of shared refrigerant flow	One or more circuits of shared refrigerant flow
Classification [1, 2]	*Air-conditioner* (air-to-air)	MSV-A-CB	
	Heat Pump (air-to-air)	HMSV-A-CB	HMSR-A-CB

Notes:
1. A suffix of "-O" following any of the above classifications indicates a *non-ducted system*.
2. "-A" indicates air-cooled condenser

Section 5. Test Requirements

5.1 All testing for *standard ratings* shall be conducted in accordance with the test methods and procedures as described in this standard and its appendices.

5.1.1 *Ducted air-conditioners*, *ducted heat pumps*, and *non-ducted heat pumps* shall be tested in accordance with ANSI/ASHRAE Standard 37 as amended by Appendix D, and ANSI/ASHRAE Standard 116 as amended by Appendix E. *Non-ducted air-conditioners* shall be tested in accordance with ANSI/ASHRAE Standard 37 as amended by Appendix D, and ANSI/ASHRAE Standard 116 as amended by Appendix E or in accordance with ANSI/ASHRAE Standard 16. When testing a *non-ducted air-conditioner* in accordance with ANSI/ASHRAE Standard 16, the default *degradation coefficient* (Cd) shall be used unless Section 6.1.3.1.1 *mandatory constant circulation system* requirement applies. In ANSI/ASHRAE Standards 16, 37 and 116, wherever terms "may" or "should" are used, they shall be taken to be mandatory requirements.

5.1.1.1 Units shall be installed per *installation instructions*. *Installation instructions* that appear in the labels applied to the unit take precedence over *installation instructions* that are shipped with the unit. For *ICM split systems*, follow the *installation instructions* provided with the *indoor unit*. For products in a certification program, additional information required for testing shall be submitted through the certification process.

5.1.2 *Variable Capacity System.* The manufacturer that claims the performance of the particular system shall provide a means to override the controls of the *variable capacity system* under test, when needed, prior to initial set-up during laboratory testing. This shall also apply to *variable capacity certified, single-capacity systems* and *variable capacity certified, two-capacity systems*.

5.1.2.1 The means for overriding the controls of the test unit shall have the ability to control the compressor and indoor blower such that the compressor(s) operates at the *specified* speed or capacity, and the indoor blower operates at the *specified* speed or delivers the *specified* airflow. These *specified* speeds, capacities and airflows

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shall be consistent with the speeds, capacities, and airflows observed when the system is tested per Appendix I.

5.1.2.1.1 For a *variable capacity certified, single-capacity system* operating with a proprietary controller, the control system shall provide a single level of compressor operation.

5.1.2.1.2 For a *variable capacity certified, two-capacity system* operating with a proprietary controller, the control system shall provide two levels of compressor operation.

5.1.2.2 Power used for any override controls that would not normally be installed in the field shall not be included in *total power*.

5.1.2.3 Systems with *digital compressor(s)* require an integrating watt-hour measuring instrument.

5.1.3 *Break-in.* Before making test measurements used to calculate performance, operate the equipment for the "break-in" period *specified* by the manufacturer, which may not exceed 20 hours. Each compressor of the unit must undergo this "break-in" period.

5.1.4 *Test Unit Installation Requirements*. For units designed for both horizontal and vertical installation or for both up-flow and down-flow vertical installations, the manufacturer shall stipulate the orientation used for testing. Conduct testing with the following installed:

5.1.4.1 Factory installed supplemental resistance heat.

5.1.4.2 Other equipment *specified* as part of the unit, including all hardware used by a *heat comfort controller* if so equipped. For *small-duct, high-velocity systems*, configure all balance dampers or restrictor devices on or inside the unit to fully open or lowest restriction.

5.1.4.3 The most restrictive filter *specified* by the manufacturer for the *indoor unit*, unless default filter pressure drop from Table 10 is utilized.

5.1.5 *Defrost control systems* shall be set for a U.S. National Average Climate (refer to Section 11.2.2) or left at manufacturer's factory settings if the published *installation instructions* provided with the equipment do not stipulate a setting for the U.S. National Average Climate. For *heat pumps* that use a *time-temperature defrost control system*, this may require changing the time setting. For *heat pumps* that use a *time adaptive defrost control system*, the frosting interval to be used during frost accumulation tests shall be *specified* by the manufacturer and the manufacturer shall provide the procedure for manually initiating the defrost at the time identified in the standard. The manufacturer shall provide information and any necessary hardware to manually initiate a *defrost cycle*.

5.1.6 *Requirements for Separated Assemblies*. All *standard ratings* for *split systems* shall be determined with at least 25 ft of interconnecting tubing on each line of the size recommended by the manufacturer. Equipment in which the interconnecting tubing is furnished as an integral part of the system, and not recommended for cutting to length, shall be tested with the complete length of tubing furnished, or with 25 ft of tubing, whichever is greater. At least 10 ft of the interconnecting tubing shall be exposed to the outside conditions. The line sizes, insulation, and details of installation shall be in accordance with the manufacturer's published recommendation. Install refrigerant pressure measuring instruments as described in Section 8.2.5 of ANSI/ASHRAE 37-2009 if they are needed to make a secondary measurement of capacity or for verification of refrigerant charge.

5.1.6.1 When testing *multi-split systems*, connect each indoor fan-coil to the *outdoor unit* using: (a) 25 ft of tubing, or (b) tubing furnished by the manufacturer, whichever is longer, per *indoor unit*. If a branching device is used, the common piping between the *outdoor unit* and the branching device shall be included in the overall length between indoor and outdoor sections.

5.1.6.1.1 *Multi-split System Line Length Correction.* For test setups where the laboratory's physical limitations require use of more than the required line length, refer to Table 4 for Cooling Capacity correction factors that shall be used when the refrigerant line length exceeds the minimum as identified in Section 5.1.6.1. Cooling capacity correction factor, F_{CCC}, is used in Section 11.1 to adjust cooling capacity.

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Table 4. Refrigerant Line Length Correction Factors[1, 2, 3,4]	
Piping length beyond the requirement (X), ft	Cooling Capacity Correction Factor, F_{CCC}
3.3 < X ≤ 20	1.01
20 < X ≤ 40	1.02
40 < X ≤ 60	1.03
60 < X ≤ 80	1.04
80 < X ≤ 100	1.05
100 < X ≤ 120	1.06

Note:
1. Due to the refrigerant line lengths required in the test setup as determined by laboratory personnel, a correction factor shall be applied to normalize the measured cooling capacity
2. The piping length X is the additional refrigerant piping length above the minimum described in 5.1.6.1 that has been applied to at least 33% (minimum of 2) of the *indoor units* in the testing configuration.
3. In all cases, the absolute minimum length necessary to physically connect the system shall be used.
4. Average piping length in addition to the minimum in Table 4 (X), ft for at least 33% (min. 2) of the *indoor units*. (The length (X) is the differential distance between the actual piping length between the *outdoor unit* and the *indoor unit* and the minimum requirement.)

5.1.6.2 *Outdoor Unit with No Match (OUWNM).* An *outdoor unit* that is not distributed in commerce with any *indoor units* and is intended for use with R22 or R22-like refrigerants shall be deemed an *outdoor unit* with No Match (OUWNM). An OUWNM shall be tested with an indoor coil having nominal tube diameter of 0.375 in and an NGIFS of 1.0 or less (as determined in Section 5.1.6.3). An R22-like refrigerant is any refrigerant that has a 95°F midpoint saturation absolute pressure that is ± 18% of the 95°F midpoint saturation absolute pressure of R22.

5.1.6.2.1 *Dry-ship Units*. Any *outdoor unit* shipped without a *specified* refrigerant from the point of manufacture, or if the unit is shipped such that more than two pounds of refrigerant is required to be added for testing to this standard shall be tested as an OUWNM. This shall not apply if either a) the factory charge is equal to or greater than 70% of the *outdoor unit* internal volume times the liquid density of refrigerant at 95°F, or b) an A2L refrigerant is approved for use.

5.1.6.3 *Indoor Coil NGIFS.* The *normalized gross indoor fin surface* (NGIFS), square inch per British thermal unit per hour (sq. in./Btu/hr), shall be calculated as follows:

$$NGIFS = 2 \cdot L_f \cdot W_f \cdot N_f / \dot{q}_{A,Full} \quad 5.1$$

5.1.7 *System Cooling Mode Expansion Device*. For cases when cooling mode expansion device is not *specified* in *installation instructions*, nor shipped with either the *indoor unit* or *outdoor unit*, test the system using a fixed orifice or piston type expansion device that is sized appropriately for the system.

5.1.8 *Refrigerant Charging.* All test samples shall be charged at *standard rating conditions* (or condition at which the manufacturer indicates in the *installation instructions*) in accordance with the *installation instructions* or labels applied to the unit, for field installation (laboratory charging instructions shall not be used). If the *installation instructions* give a *specified* range for superheat, subcooling, or refrigerant pressure, the average of the range shall be used to determine the refrigerant charge. Perform charging of near-azeotropic and zeotropic refrigerants only with refrigerant in the liquid state.

If there are no *installation instructions* or the *installation instructions* do not provide parameters and target values, set superheat to a target value of 12°F for fixed orifice systems, or set subcooling to a target value of 10°F for expansion valve systems.

5.1.8.1 Except for mix-matched systems covered in Section 5.1.8.2 and *multi-split systems*, in the event of

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conflicting information between charging instructions, the *outdoor unit* label prevails, followed by *installation instructions* of the *outdoor unit*, followed by the *installation instructions* of the *indoor unit*. For *multi-split systems*, the hierarchy is *outdoor unit installation instructions* prevail, followed by the *outdoor unit* label, followed by the *indoor units' installation instructions*. Conflicting information is defined as multiple conditions given for charge adjustment where all conditions *specified* cannot be met. In such instances of conflicting information, follow the hierarchy in Table 5 for priority. Unless the manufacturer specifies a different charging tolerance, the tolerances identified in Table 5 shall be used for all products.

Table 5. Test Condition Tolerance for Charging Hierarchy

Fixed Orifice			Expansion Valve		
Priority	Method	Tolerance	Priority	Method	Tolerance
1	Super-heat	± 2.0°F	1	Subcooling	10% of the Target Value; No less than ± 0.5°F, No more than ± 2.0°F
2	High Side Pressure or Saturation Temperature	± 4.0 psi or ± 1.0°F	2	High Side Pressure or Saturation Temperature	± 4.0 psi or ± 1.0°F
3	Low Side Pressure or Saturation Temperature	± 2.0 psi or ± 0.8°F	3	Low Side Pressure or Saturation Temperature	± 2.0 psi or ± 0.8°F
4	Low Side Temperature	± 2.0°F	4	*Approach Temperature*	± 1.0°F
5	High Side Temperature	± 2.0°F	5	Charge Weight	0.5% or 1.0 oz, whichever is greater
6	Charge Weight	± 2.0 oz			

The refrigerant charge obtained at the *standard rating condition* shall then be used to conduct all cooling cycle and heating cycle tests unless an adjustment is required based on the sections below. Once the correct refrigerant charge is determined, all tests shall run until completion without further modification.

Note: After completion of all required tests, it is good laboratory practice to achieve A_{Full} test conditions for 30 continuous minutes and compare results to the previous set of A_{Full} tests. When comparing results, measured charge parameters outside of those listed in the manufacturer's *installation instructions* or Table 5 is an indication refrigerant charge or other parameters may have changed. An analysis should be performed and if measurements indicate that refrigerant charge has leaked during the test, repair the refrigerant leak, repeat any necessary set-up steps, and repeat all tests.

5.1.8.2 *Mix-Matched Systems.* For systems consisting of an *OUM outdoor unit* and an *ICM indoor unit* with differing charging procedures the refrigerant charge shall be adjusted per the *ICM installation instructions*. If instructions are provided only with the *outdoor unit* or are provided only with an *ICM indoor unit*, then use the provided instructions.

5.1.8.3 *Heat Pumps.* Refrigerant charge shall be set at the A_{Full} conditions or as *specified* by the manufacturer. The initial heating test shall be $H1_{Full}$ or $H1_{Nom}$ test, charge parameters shall be checked per the *installation instructions* (if provided). If conditions are within the range *specified* by *installation instructions*, then continue with the remainder of the tests. For heating-only *heat pumps*, use the $H1_{Full}$ test.

5.1.8.3.1 If heating refrigerant charge parameters are not within the range *specified* by the *installation instructions*, then the smallest adjustment to refrigerant charge to get within the heating refrigerant charge parameters shall be made. After making this adjustment in the $H1_{Full}$ or $H1_{Nom}$ test, refrigerant charge shall be verified in the cooling mode to be within the greater of the *installation instruction* tolerances or the tolerances listed in the Table 5 above before re-running the cooling tests. For heating-only *heat pumps*, use the $H1_{Full}$ test.

5.1.8.4 *Single Package Unit.* Unless otherwise directed by the *installation instructions*, install one or more refrigerant line pressure gauges during the setup of the unit, located depending on the parameters used to verify

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or set charge, as described in this section:

5.1.8.4.1 Install a pressure gauge at the location of the service valve on the liquid line if charging is on the basis of subcooling, or high side pressure, or corresponding saturation, or dew point temperature;

5.1.8.4.2 Install a pressure gauge at the location of the service valve on the suction line if charging is on the basis of superheat, or low side pressure, or corresponding saturation, or dew point temperature.

Use methods for installing pressure gauge(s) at the required location(s) as indicated in *installation instructions* if *specified*.

5.1.9 *Psychrometric Testing of Non-Ducted Systems.* When the psychrometric method is used for testing *non-ducted systems*, it is necessary to ascertain whether the attachment of the indoor side test apparatus changes the performance of the equipment being tested, and if so, to correct for this change.

5.1.9.1 The equipment shall have temperature measuring devices attached to return bends at approximately the midpoints of each indoor coil and *outdoor coil* circuit or at points not affected by vapor superheat or liquid subcooling. Equipment not sensitive to refrigerant charge may, as an alternative, install pressure measuring devices connected to access valves or tapped into the suction and discharge lines. Indoor fan power shall be sub-metered.

5.1.9.2 The equipment shall then be operated at the initial full-load test conditions, with the indoor-side test apparatus disconnected. Data shall be sampled at equal intervals that span five minutes or less for a period of one-half hour after equilibrium has been attained.

5.1.9.3 The indoor side test apparatus shall then be connected to the equipment and the temperatures or saturated temperatures corresponding to the measured pressures indicated by the aforementioned instrumentation shall be noted.

5.1.9.4 After equilibrium is again attained, the average indoor fan power shall agree within the greater of 2% or 5 watts of the average indoor fan power observed during the preliminary test, and the temperatures of coils or saturation temperatures determined based on pressure measurements shall agree within ±0.3°C (±0.5°F) of the average coil or saturation temperatures observed during the preliminary test. If these tolerances are exceeded, the airflow measurement apparatus fan shall be adjusted to change indoor airflow as needed such that the required agreement is attained. If the adjustment of the airflow measurement apparatus fan results in violating the external static pressure tolerance, adjust the outlet plenum(s) such that the required agreement and external static pressure tolerance is attained.

5.2 *Cyclic Test Requirements*. For *single stage systems* or *two-stage systems*, cycle the compressor OFF for 24 minutes and then ON for 6 minutes (total cycle time is 30 minutes). For units having a *variable capacity compressor*, cycle the compressor OFF for 48 minutes and then ON for 12 minutes (total cycle time is 60 minutes). Repeat the OFF/ON compressor cycling pattern until the test is completed. Allow the controls of the unit to regulate cycling of the outdoor fan.

5.3 Table 6 summarizes the various sections of this standard that are applicable to different types of equipment.

Section 6. Rating Requirements

6.1 *Standard Ratings. Standard ratings* shall be established at the *standard rating conditions* identified per Tables 7 and 8. *Standard ratings* shall be established for all refrigerants listed on the nameplate of product.

Standard ratings relating to cooling or heating capacities shall be net values, including the effects of circulating-fan heat, but not including supplemental resistance heat. Power input used for calculating efficiency shall be the *total power*. Supplemental electric heat is used in SHORE calculations as noted in Section 11.

Standard ratings of systems (other than *space constrained products*) which do not have indoor air-circulating fans furnished as part of the model, i.e., *coil-only systems*, shall be established by subtracting from the *total cooling capacity* 1,181 Btu/h per 1,000 scfm of indoor air circulated for tests using 100% airflow and 543 Btu/h per 1,000 scfm of indoor air circulated for tests

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using 65% airflow, and by adding the same amount to the heating capacity. *Total power* for both heating and cooling shall be increased by the fan power coefficient 346 W per 1,000 scfm of indoor air circulated for tests using 100% airflow and the fan power coefficient 159 W per 1,000 scfm of indoor air circulated for tests using 65% airflow.

For *space constrained coil-only systems*, *Standard ratings* shall be established by subtracting from the *total cooling capacity* 1,000 Btu/h per 1,000 scfm of indoor air circulated for tests using 100% airflow and 461 Btu/h per 1,000 scfm of indoor air circulated for tests using 65% airflow, and by adding the same amount to the heating capacity. *Total power* for both heating and cooling shall be increased by the fan power coefficient 293 W per 1,000 scfm of indoor air circulated for tests using 100% airflow and the fan power coefficient 135 W per 1,000 scfm of indoor air circulated for tests using 65% airflow.

For all *coil-only systems*, in any case where the *specified* reduced airflow is greater than 65% of the full airflow, use linear interpolation of the default fan power coefficients based on the *specified* reduced airflow between the *specified* fan power coefficient at 65 percent of full airflow and the *specified* fan power coefficient at 100 percent.

Table 6. Informative Guidance for Using AHRI Standard 210/240

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			General Testing and Set-up Issues	Rating Procedure Issues			Calculations		
				General	Cooling	Heating	General	Cooling	Heating
Requirements for all units			5.1.1, 5.1.3, 5.1.4, 5.1.8, 5.2, Section 5, Section 6, Appendix D, Appendix E, E1, E3, E4, E7, E8, E9, E11, E13, E14, E15.2, E17, E18, F1, F2, F3.2, F4, F5, F6, F7, F8, F9, F13, Appendix G	5.1.1, 6.1, Table 7, Table 8, 6.1.1, 6,1.2, 6.1.3, 6.1.4, 6.1.5.1, Table 10, 6.1.8, 6.4, 6.4.2, 6.4.3, 6.4.4, 6.4.5,	6.1.5		11.3	11.1.1 to 11.1.6, 11.2.1	
Requirements for all *Heat Pumps*			5.1.5, 5.1.8.3, E16, F10	6.1.6, 6.1.7, 6.1.8.4, 6.4.1.4	F11	6.1.5.5, 6.1.5.7, F10, F12			11.1.7 to 11.1.15, 11.2.2
Additional Requirements	System Configurations (more than one may apply)	*Blower Coil System*	5.1.6, E5, D4.5, D5.1.1, D7.1.2.1						
		Coil-only System	5.1.6, D4.4, D5.1.1, D7.1.2.1,	6.1	6.1.5.3.1				
		Non-ducted System	E12, F3.1 , F3.3		6.1.5.1.4, 6.1.5.3.4, F11.9	6.1.5.6.4			
		Outdoor Unit with No Match	5.1.6.2, 5.1.6.3	6.1.8.6, 6.4.1.6	6.1.3.1.4				
		Single-package	5.1.8.4, E5, D5.2.1,	6.1.8.7, 6.4.1.1					
		Heating-only *Heat Pump*				6.1.5.5.5, 6.1.5.6.6, 6.1.5.6.7			
		Two-capacity Northern Heat Pump			6.1.5.3	6.1.3.4, 6.1.5.5.4, 6.1.5.6.5			
		Triple-capacity Northern Heat Pump			6.1.5.3, 6.1.5.4	6.1.3.4, 6.1.5.5.4, 6.1.5.6.5			
		SDHV	E6	Table 10, 6.4.3.3.3					
		Multi-split System	5.1.6.1, E10	6.1.8.5, 6.4.1.7, 6.4.3.3					
	Modulation	Single Stage Compressor		6.1.8.1, 6.4.1.2	6.1.3.1.1	6.1.3.2.1		11.2.1.1	11.2.2.1
		Two-capacity Compressor		6.1.8.2, 6.4.1.2	6.1.3.1.2, 6.1.5.3,	6.1.3.2.2, 6.1.3.4, 6.1.5.6		11.2.1.2	11.2.2.2
		Variable Capacity Compressor	5.1.2, E2		6.1.3.1.3, 6.1.5.4	6.1.3.2.3, 6.1.5.7, 6.1.5.8		11.2.1.3	11.2.2.3
	Special	*Heat Pump* with *Heat Comfort Controller*							11.2.2.4
		Units with a Multi-speed Outdoor Fan	E15.1						
		MIB	E5.2	6.1.5.9	6.1.5.2.5, 6.1.5.3.4			11.2.1.1.1, 11.2.1.2	11.2.2.1.3, 11.2.2.2
		ICM	5.1.1.1, 5.1.8.2	6.1.8.3, 6.4.1.4, 6.4.1.5					

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Table 7. Required Tests[1]

Test Name	Single Stage System	Single Stage Outdoor Unit with VAV/MIB	Variable Capacity Certified, Single-capacity System	Two-stage System[8]	Two-stage Northern Heat Pump	Variable Capacity Certified, Two-capacity System	Variable Capacity System	Triple-capacity Northern Heat Pump
Cooling Mode [2]								
A_{Full}	R	R	R	R	R	R	R	R
A_{Low}		R						
B_{Full}	R	R	R	R	R	R	R	R
B_{Low}		R		R		R	R	R
C_{Full}	O [3]		O [3]	O [3]	O [3]	O [3]		O [3]
C_{Low}		O		O [3]		O [3]		O [3]
D_{Full}	O [3]		O [3]	O [3]	O [3]	O [3]		O [3]
D_{Low}		O		O [3]		O [3]		O [3]
E_{Int}							R	
F_{Low}				R		R	R	R
G_{Low}							O [3]	
I_{Low}							O [3]	
Heating Mode [4]								
$H0_{Low}$				R	R	R	R	R
$H1_{Full}$	R	R	O	R	R	O	O	R
$H1_{Low}$		R		R	R	R	R	R
$H1C_{Full}$	O [5]		O [5]	O [5]	O [5]			O [5]
$H1C_{Low}$		O[5]		O [5]	O [5]	O [5]	O [5]	O [5]
$H1_{Nom}$			R			R	R	
$H2_{Boost}$								O
$H2_{Full}$	R	R	R	R	R	O	O	R
$H2_{Low}$		O [6]		O [6]	O [6]	O [6]		O [6]
$H2_{Int}$							R	
$H3_{Full}$	R	R	R	R	R	R	R	R
$H3_{Low}$		R		R [7]	R [7]	R		R [7]
$H3_{Boost}$								R
$H3C_{Boost}$								O
$H4_{Full}$	O [9]	O [9]	O [9]	O [9]	O [9]	O [9]	O [9]	
$H4_{Boost}$								R

Notes:
1. "R" means Required, "O" means Optional, and a blank cell indicates test is not applicable for the given product type.
2. Required for any unit that has a cooling mode function.
3. Refer to Section 6.1.3.1. Required for systems having a *mandatory constant circulation system*
4. Required for any unit that has a heating mode function.
5. Refer to Section 6.1.3.2. Required for systems having a *mandatory constant circulation system*
6. Refer to Section 6.1.3.4.
7. Not required if the *heat pump* locks out low capacity at outdoor temperatures less than 37.0°F.
8. *Two-stage system* tests apply for *MIB*.
9. Required for all systems certified as *cold climate heat pump*.

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Table 8. Test Conditions[1]

Test Name	Air Entering Outdoor Unit [2] (°F)	Air Entering Indoor Unit [2] (°F)	Compressor Speed or Operating level [3]	Indoor Airflow [4]
Cooling Mode				
A_{Full}	95.0 / 75.0 [5,6]	80.0 / 67.0	$Full_C$ [12]	$Full_C$ [12]
A_{Low}	95.0 / 75.0 [5,6]	80.0 / 67.0	$Full_C$ [12,16]	Low_C
B_{Full}	82.0 / 65.0 [5,6]	80.0 / 67.0	$Full_C$	$Full_C$
B_{Low}	82.0 / 65.0 [5,6]	80.0 / 67.0	Low_C [16]	Low_C
C_{Full}	82.0 / 58.0 [5,6]	80.0 / 57.0 [7]	$Full_C$	$Full_C$
C_{Low}	82.0 / 58.0 [5,6]	80.0 / 57.0 [7]	Low_C [16]	Low_C
D_{Full}	82.0 / 58.0 [5,6]	80.0 / 57.0 [7]	$Full_C$	$Full_C$ [8]
D_{Low}	82.0 / 58.0 [5,6]	80.0 / 57.0 [7]	Low_C [16]	Low_C [8]
E_{Int}	87.0 / 69.0 [5,6]	80.0 / 67.0	Int_C	Int_C
F_{Low}	67.0 / 53.5 [5,6]	80.0 / 67.0	Low_C [16]	Low_C
G_{Low}	67.0 / 58.0 [5,6]	80.0 / 57.0 [7]	Low_C [16]	Low_C
I_{Low}	67.0 / 58.0 [5,6]	80.0 / 57.0 [7]	Low_C [16]	Low_C [8]
Heating Mode				
$H0_{Low}$	62.0 / 56.5	70.0 / 60.0 [9]	Low_H [16,21]	Low_H
$H0C_{Low}$	62.0 / 56.5	70.0 / 60.0 [9]	Low_H [16,21]	Low_H
$H1_{Full}$	47.0 / 43.0	70.0 / 60.0 [9]	$Full_H$ [19]	$Full_H$
$H1_{Low}$	47.0 / 43.0	70.0 / 60.0 [9]	Low_H [16,21]	Low_H
$H1C_{Full}$	47.0 / 43.0	70.0 / 60.0 [9]	$Full_H$	$Full_H$ [8]
$H1C_{Low}$	47.0 / 43.0	70.0 / 60.0 [9]	Low_H [16,21]	Low_H [8]
$H1_{Nom}$	47.0 / 43.0	70.0 / 60.0 [9]	Nom_H [15,20]	Nom_H [10]
$H2_{Boost}$	35.0 / 33.0	70.0 / 60.0 [9]	$Boost_H$	$Full_H$
$H2_{Full}$	35.0 / 33.0	70.0 / 60.0 [9]	$Full_H$ [19]	$Full_H$
$H2_{Low}$	35.0 / 33.0	70.0 / 60.0 [9]	Low_H [16,21]	Low_H
$H2_{Int}$	35.0 / 33.0	70.0 / 60.0 [9]	Int_H	Int_H
$H3_{Full}$	17.0 / 15.0	70.0 / 60.0 [9]	$Full_H$ [19]	$Full_H$
$H3_{Low}$	17.0 / 15.0	70.0 / 60.0 [9]	Low_H [16,21]	Low_H
$H3_{Boost}$	17.0 / 15.0	70.0 / 60.0 [9]	$Boost_H$	$Full_H$
$H3C_{Boost}$	17.0 / 15.0	70.0 / 60.0 [9]	$Boost_H$	$Full_H$
$H4_{Full}$	5.0 / 4.0 [11]	70.0 / 60.0 [9]	$Full_H$ [18]	$Full_H$
$H4_{Boost}$	5.0 / 4.0 [11]	70.0 / 60.0 [9]	$Boost_H$	$Full_H$

Notes:

1. *Test condition tolerances* are defined within ASHRAE Standard 37, ASHRAE Standard 116 Table 3b for *cyclic tests*, and Section 8.7 of this standard.
2. Values listed are dry-bulb temperature / wet-bulb temperature, °F.
3. Refer to Section 3 for definition of "Full", "Low", "Int" and "Boost" for each compressor type.
4. Refer Section 6.1.5 for airflow details.
5. Wet-bulb temperature specification required only if unit rejects condensate to *outdoor coil*.
6. For *single package units* that do not reject condensate to the *outdoor coil*, where all or part of the equipment is located in the outdoor room, adjust the outdoor wet-bulb temperature such that the dew point is 60.5 ± 3.0°F.
7. The entering air must have a low enough moisture content so no condensate forms on the indoor coil (It is recommended that an indoor wet-bulb temperature of 57.0°F or less be used.)
8. For *cyclic tests* use the same airflow as *steady state test* which is defined as the same static pressure difference or velocity pressures across the nozzle(s) during the ON period.
9. Maximum value for all tests. If outdoor air enthalpy method is used for *single package heat pumps*, then the indoor wet-bulb temperature shall be adjusted to match as close as reasonably possible to the dew point of the outdoor entering air.
10. Refer to Section 6.1.5.8.
11. 4.0 Maximum.
12. For *two-capacity northern heat pump*, $Full_C$ means operating compressor and airflow at *low stage*.
13. For *three-capacity northern heat pump*, $Full_C$ means operating compressor and airflow at middle stage, Low_C means compressor and airflow at *low stage*. Note: Tests D_{Full}, D_{Low}, I_{Low}, $H1C_{Full}$, and $H1C_{Low}$ are cyclic in nature. Some heating tests, particularly $H2_{Full}$ and $H2_{Low}$ will be transient in nature. All other tests are *steady state tests*.
14. For *single package units* that do not reject condensate to the *outdoor coil*, where all or part of the equipment is located in the outdoor room, outdoor wet-bulb temperature must be less than 58°F.
15. Maximum speed that the *system controls* would operate the compressor in normal operation in 47°F ambient temperature.
16. For all *low stage* tests of *MIB* with *single stage systems*, compressor capacity is *full stage*.
17.
18. Maximum speed that the *system controls* would operate the compressor in normal operation in 5°F ambient temperature.
19. The compressor shall operate for the $H1_{Full}$ and $H3_{Full}$ tests at the same heating full speed, measured by RPM or power input frequency (Hz), as the maximum speed at which the *system controls* would operate the compressor in normal operation in 17 °F ambient temperature. The $H1_{Full}$ test is not needed if the $H1_{Nom}$ test uses this same compressor speed.
20. The compressor shall operate for the $H1_{Nom}$ test at the maximum speed at which the *system controls* would operate the compressor in normal operation in 47 °F ambient temperature. Additionally, for a cooling/heating *heat pump*, the compressor shall operate for the $H1_{Nom}$ test at a speed, measured by RPM or power input frequency (Hz), no lower than the speed used in the A_{Full} test if the tested $H1_{Nom}$ heating capacity is less than the tested A_{Full} cooling capacity.

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21. The compressor shall operate at the same heating minimum speed, measured by RPM or power input frequency (Hz), for the $H0_{Low}$, $H1C_{Low}$, and $H1_{Low}$ tests.

6.1.1 ***Values of Standard Capacity Ratings.*** These ratings shall be expressed only in terms of Btu/h as shown in Table 9.

Table 9. Values of Standard Capacity Ratings

Capacity Ratings, Btu/h	Multiples, Btu/h
< 20,000	100
≥ 20,000 and < 38,000	200
≥ 38,000 and < 65,000	500

6.1.2 *Values of Measures of Energy Efficiency and Power*. Standard measures of energy efficiency, whenever published, shall be expressed in multiples of the nearest 0.02 W/W for *COP* and COP_{Peak}, 0.05 Btu/(W×h) for *EER*, *SCORE* and *SHORE*.

6.1.3 *Standard Rating Tests.*

6.1.3.1 *Default Cooling Degradation Coefficient*

6.1.3.1.1 For systems having a *mandatory constant circulation system*, the optional *cyclic test* shall be performed. The *degradation coefficient* must be evaluated using the respective *cyclic tests* in Table 7 conducted in accordance with Section E11 of Appendix E. The following subsections of 6.1.3.1 shall not apply for systems having a *mandatory constant circulation system*.

6.1.3.1.2 For *single stage systems*, if the optional C_{Full} and D_{Full} tests are not performed, or the calculated result for $C_D^{c,Full}$ is greater than the default value of 0.20, the default value shall be used for the cooling *degradation coefficient*, C_D^c.

6.1.3.1.3 For *variable capacity certified, single-capacity systems*, if the optional C_{Full} and D_{Full} tests are not performed, or the calculated result for $C_D^{c,Full}$ is greater than the default value of 0.25, the default value shall be used for the cooling *degradation coefficient*, C_D^c.

6.1.3.1.4 For *two-capacity systems*, if the optional C_{Low} and D_{Low} tests are not performed, or the calculated result for $C_D^{c,low}$ is greater than 0.20, a default value of 0.20 shall be used for the *low stage* cooling *degradation coefficient*, $C_D^{c,Low}$. In this case, if using default value for $C_D^{c,Low}$, use default value for $C_D^{c,Full}$. For *two-capacity systems* that lock out low capacity operation at high outdoor temperatures, if the optional C_{Full} and D_{Full} tests are not performed, or the calculated result for $C_D^{c,Full}$ is greater than 0.20, the default value for *full stage* shall be the value used for *low stage*.

6.1.3.1.5 For *variable capacity certified, two-capacity systems*, if the optional C_{Low} and D_{Low} tests are not performed, or the calculated result for $C_D^{c,low}$ is greater than 0.25, a default value of 0.25 shall be used for the *low stage* cooling *degradation coefficient*, $C_D^{c,Low}$. In this case, if using default value for $C_D^{c,Low}$, use default value for $C_D^{c,Full}$. For *two-capacity systems* that lock out low capacity operation at high outdoor temperatures, if the optional C_{Full} and D_{Full} tests are not performed, or the calculated result for $C_D^{c,Full}$ is greater than 0.25, the default value for *full stage* shall be the value used for *low stage*.

6.1.3.1.6 For *variable capacity systems*, if the optional G_{Low} and I_{Low} tests are not performed, or the calculated result for $C_D^{c,Low}$ is greater than the default value of 0.25, the default value shall be used for the cooling *degradation coefficient*, C_D^c.

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6.1.3.1.7 For OUWNM, if the optional C_{Full} and D_{Full} tests are not performed, a default value of 0.25 shall be used for the cooling *degradation coefficient*, C_D^c.

6.1.3.2 *Default Heating Degradation Coefficient.*

6.1.3.2.1. For systems having a *mandatory constant circulation system*, the optional *cyclic test* shall be performed. The heating *degradation coefficient* must be evaluated using the respective *cyclic tests* in Table 7 conducted in accordance with Section E12 of Appendix E. The following subsections of 6.1.3.2 shall not apply for systems having a *mandatory constant circulation system*.

6.1.3.2.2 For *single stage systems* and *variable capacity certified, single-capacity systems*, if the optional $H1C_{Full}$ test or $H1C_{Low}$ is not performed, or the calculated result for $C_D^{c,Full}$ is greater than the default value of 0.25, the default value shall be used for the heating *degradation coefficient*, C_D^h.

6.1.3.2.3 For *two-capacity systems*, *triple-capacity northern heat pumps*, and *variable capacity certified, two-capacity systems*, if the optional $H1C_{Full}$ and $H1C_{Low}$ tests are not performed, or the calculated result for $C_D^{h,Low}$ is greater than 0.25 ,a default value of 0.25 shall be used for the *low stage* heating *degradation coefficient*, $C_D^{h,Low}$. In this case, if using default value for $C_D^{h,Low}$, use default value for $C_D^{h,Full}$. For *two-capacity systems* that lock out *low stage* operation at low outdoor temperatures, if the optional $H1C_{Full}$ test is not performed, or the calculated results for $C_D^{h,Full}$ is greater than 0.25 the default value for *full stage* shall be the value used for *low stage*. Additionally, for *triple-capacity northern heat pumps* if the optional $H3C_{Boost}$ is not performed, the default value 0.25 shall be used.

6.1.3.2.4 For *variable capacity systems*, if the optional $H1C_{Full}$ and $H1C_{Low}$ tests are not performed, or the calculated result for C_D^h is greater than 0.25, the default value shall be used for the heating *degradation coefficient*, C_D^h.

6.1.3.3 *Test Sequence.* When testing a *ducted system* (except if a heating-only *heat pump*), conduct the A_{Full} test first to establish the cooling full airflow. For ducted *heat pumps* where the heating and cooling full airflows are different, make the first heating mode test one that requires the heating full airflow. For ducted heating-only *heat pumps*, conduct the $H1_{Full}$ Test first to establish the heating full airflow. When conducting a *cyclic test*, always conduct it immediately after the *steady state test* that requires the same test conditions. For *variable capacity systems*, the first test using the cooling minimum airflow shall precede the E_{Int} test, and the first test using the heating minimum airflow shall precede the $H2_{Int}$ test. The test laboratory makes all other decisions on the test sequence.

6.1.3.4 *Low-Capacity Heating Tests in 35°F Conditions for Two-Stage Heat Pumps, Two-capacity Northern Heat Pumps, and Triple-capacity Northern Heat Pumps.* If the optional $H2_{Low}$ test is not performed, capacity and power for this condition shall be calculated per Equation 11.44 and Equation 11.50.

6.1.4 *Electrical Conditions.* For products with a single nameplate rated voltage, *standard rating* tests shall be performed at the nameplate rated voltage. For dual nameplate voltage equipment where 230 V or 240 V is the higher of the 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. For *split systems*, if the *indoor unit* has a different nameplate voltage than the *outdoor unit*, use the *indoor unit* nameplate voltage for the operation of the *indoor unit*. However, if either the indoor or the *outdoor unit* has a 208 V or 200 V nameplate voltage and the other unit has a 230 V nameplate rating, select the voltage supply on the *outdoor unit* for testing. Otherwise, supply each unit with its own nameplate voltage.

6.1.4.1 *Frequency.* For equipment which is 60 Hz only or 50 Hz only, *standard ratings* shall be provided at the rated frequency. For equipment which can be operated at both 50 and 60 Hz, *standard ratings* shall be provided for each frequency, but tests shall be performed, at a minimum, at 60 Hz.

6.1.5 *Airflow Through the Indoor Coil.*

6.1.5.1 *General Indoor Airflow Concerns.*

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6.1.5.1.1 *Airflow-control Setting. Airflow-control setting(s)* shall be determined before testing begins. Unless otherwise identified within Section 6.1.5 or its subsections, no changes shall be made to the *airflow-control setting(s)* after initiation of testing. *Specified* instructions for setting fan speed or controls shall be used. If there are no instructions for setting fan speed or controls, use the as-shipped settings. If there is no *specified* cooling full airflow, use Equation 6.1. If there is no *specified* heating full airflow, use Equation 6.2.

$$\dot{Q}_{A,Full} = \frac{\dot{q}^{C}_{Cert}}{12{,}000} \cdot 400 \qquad 6.1$$

$$\dot{Q}_{H1,Full} = \frac{\dot{q}^{H}_{Cert}}{12{,}000} \cdot 400 \qquad 6.2$$

6.1.5.1.2 *Ducted Systems with a PSC AMS, Constant-torque AMS, or Constant-volume AMS Operating on Intermediate or Low Stage*. For any test other than A_{Full}, the *specified* airflow for a given test shall not cause the ESP during any test calling for low or intermediate airflow to go below the minimum ESP values identified in Equation 6.3.

$$\Delta P_{st_i} = \Delta P_{st_{A,Full}} \cdot \left[\frac{Q_{i,x}}{\dot{Q}_{A,Full}}\right]^2 \qquad 6.3$$

6.1.5.1.3 *Constant-volume AMS Static Settings*. For any *steady state test* using a *constant-volume AMS*, achieve the ESP as close to (but not less than) the applicable Table 10 value that does not cause either airflow variations Q_{Var} (as defined by Equation 6.4) of more than 10% or an automatic shutdown of the indoor blower

$$Q_{Var} = \left[\frac{\dot{Q}_{max} - \dot{Q}_{min}}{\left(\frac{\dot{Q}_{max} + \dot{Q}_{min}}{2}\right)}\right] \cdot 100 \qquad 6.4$$

The following additional test steps are required if the measured ESP exceeds the target value by more than 0.03 in H_2O.

6.1.5.1.3.1 Measure and record the average power consumption of the indoor fan motor ($\dot{E}_{fan,1}$) and record the corresponding ESP (ESP_1) during or immediately following the 30-minute interval used for determining capacity.

6.1.5.1.3.2 After completing the 30-minute interval, adjust the exhaust fan of the airflow measuring apparatus until the ESP increases to approximately the value defined by Equation 6.5:

$$ESP_2 \approx ESP_1 + (ESP_1 - ESP_{min}) \qquad 6.5$$

6.1.5.1.3.3 Upon achieving steady state at the higher external static pressure ESP_2 condition, record average power consumption and average ESP for a minimum 5-minute interval.

6.1.5.1.3.4 Calculate the average power consumption of the indoor fan motor at ESP_{min} using linear extrapolation. For all *steady state tests*, the *total power* consumption shall be adjusted by P_{adj} as calculated per Equation 6.6. The adjustments are as shown in Section 11 equations.

$$P_{adj} = \frac{(P_{fan,2} - P_{fan,1})}{(ESP_2 - ESP_1)} \cdot (ESP_{min} - ESP_1) \qquad 6.6$$

6.1.5.1.3.5 For all *steady state tests*, *total cooling capacity* shall be increased and *total heating capacity* shall be decreased by $\dot{q}_{adj}$ as calculated per Equation 6.7, as shown in Section 11.

Documents
Document Sharing Hub
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$$\dot{q}_{adj} = 3.412 \cdot P_{adj} \quad 6.7$$

6.1.5.1.4 *Non-ducted Systems*. *Specified* instructions for setting fan speed or controls shall be used. If there are no instructions for setting fan speed or controls, use the as-shipped settings.

6.1.5.1.5 *Overspeeding*. If a unit's controls allow for overspeeding the indoor blower (usually on a temporary basis), take the necessary steps to prevent overspeeding during all tests.

6.1.5.1.6 *Full Airflow Adjustment to Meet Minimum External Static Pressure*. For cooling full airflow, or for heating full airflow on heating-only *heat pumps*, if ESP is lower than the minimum values identified in Table 10 at the manufacturer's *specified* cooling full airflow or heating full airflow, the ESP shall be increased by reducing the airflow of the airflow measuring apparatus. If increasing ESP reduces airflow of the unit under test to less than 90% of *specified* airflow and the minimum ESP is still not achieved, then the next higher *airflow-control setting* (if available) shall be utilized to obtain *specified* airflow. If a higher *airflow-control setting* is not available, continue to decrease airflow of the airflow measuring apparatus until the required minimum ESP is achieved and use the resulting airflow of the unit under test as the cooling full airflow or heating full airflow as appropriate. Any manual *airflow-control setting* shall remain unchanged for all other tests.

6.1.5.1.7 *Other Airflow Adjustment to Meet Minimum External Static Pressure*. During a *low stage* or *intermediate compressor speed* test, if the ESP is lower than the minimum values calculated per Equation 6.3 at manufacturer *specified* airflow, the ESP shall be increased by reducing the airflow of the airflow measuring apparatus. If increasing ESP reduces airflow of the unit under test to less than 90% of *specified* airflow and the minimum ESP is still not achieved, then the next higher *airflow-control setting* (if available) shall be utilized to obtain *specified* airflow. If a higher *airflow-control setting* is not available, continue to decrease airflow of the airflow measuring apparatus until the required minimum ESP is achieved and use the resulting airflow of the unit under test as the cooling full airflow. Manual adjustments of *airflow-control settings* are not permitted.

6.1.5.1.8 *Units That Control To Different Constant Airflow At Each Test Condition Using The Same Blower Setting.* Use full, intermediate, and minimum airflows at each test condition that represent normal installation. Additionally, if conducting the *dry-coil tests* on *variable capacity systems*, operate the unit in the same control mode as used for the F_{Low} Test. If performed, conduct the steady state C Test and the cyclic D Test with the *single stage system* or *two-capacity system* operating in the same control mode as used for the B or B_{Low} Test. ESP shall be controlled within -0.00 to +0.03 in H_2O of the target minimum ESP.

6.1.5.1.9 For units having a variable-speed indoor blower that is modulated to adjust the sensible to total (S/T) cooling capacity ratio, use cooling full and cooling minimum airflows that represent a normal installation. Additionally, if conducting the *dry-coil tests*, operate the unit in the same S/T capacity control mode as used for the B_{Low} Test.

6.1.5.2 *Cooling Full Airflow*. The manufacturer shall have *specified* the cooling full airflow, $Q_{A,Full}$. The *specified* cooling full airflow value shall be utilized for all tests that call for cooling full airflow, unless the measured full airflow, when divided by the measured indoor air-side *total cooling capacity*, exceeds 37.5 scfm per 1,000 Btu/h or otherwise modified by the following subsections. If this ratio is exceeded, reduce the full airflow until this ratio is equaled. If modified, that same modified value shall be utilized for all tests that call for cooling full airflow. Static pressure requirements only apply to the A_{Full} test unless otherwise indicated.

6.1.5.2.1 *Coil-only Systems*. The *specified* cooling full airflow shall not cause air static pressure drop across the *indoor unit* during the A_{Full} test to exceed 0.30 in H_2O. If this maximum static is exceeded, reduce the airflow with no minimum until the maximum static is achieved. Use this reduced airflow for all tests that require the cooling full airflow.

6.1.5.2.2 *PSC AMS or Constant-torque AMS Ducted Systems*. The *specified* cooling full airflow shall not cause the ESP during the A_{Full} to go below the minimum values identified in Table 10. See Section 6.1.5.1.6. For *single-split low-static blower coil systems*, test at the *specified* full airflow (not to exceed 33.3 scfm per 1,000 Btu/h of measured indoor air-side *total cooling capacity*) at the maximum airflow setting. If ESP achieved at the *specified* airflow is less than 0.1 in H_2O, adjust the airflow measurement apparatus fan to reduce airflow and increase ESP until this level is

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Full document details: AHRI Standard 1600-2024 (I-P) - Performance Rating of Unitary Air-conditioning and Air-source Heat Pump Equipment Appendix Lis r...

achieved.

Table 10. Minimum ESP for Ducted Systems Tested with an Indoor AMS Installed	
Product Type[1]	**Minimum ESP (in H_2O)[2,3]**
Conventional (*i.e.*, all *central air-conditioners* and *heat pumps* not otherwise listed in this table)	0.50
Ceiling-mount Blower Coil Systems and *Wall-mount Blower Coil Systems*	0.30
Mobile Home Blower Coil Systems	0.30
Low-static Blower Coil Systems	0.10
Low-static single-split Blower Coil systems	See Section 6.1.5.2.2
Mid-static Blower Coil Systems	0.30
Small-duct, High-velocity Systems	1.15
Space Constrained Products	0.30
Notes: 1. Refer to Definitions, Section 3. 2. For ducted units tested without an air filter installed, increase the applicable tabular value by 0.08 in H_2O. 3. If a closed-loop, air-enthalpy test apparatus is used on the indoor side, limit the resistance to airflow on the inlet side of the *blower coil indoor unit* to a maximum value of 0.1 in H_2O	

6.1.5.2.3 *Constant-volume AMS Ducted Systems*. All tests requiring cooling full airflow shall be performed at the minimum ESP values identified in Table 10 (-0.00,+0.03) in H_2O using the manufacturer's *specified airflow-control setting* . If the manufacturer does not provide a *specified airflow-control setting*, the manufacturer's airflow tables shall be used to determine the appropriate *airflow-control setting*. Refer to Section 6.1.5.1.3.

6.1.5.2.4 *Non-ducted Systems.* The cooling full airflow is the airflow rate that results during each test when the unit is operated at an ESP of 0.00 (-0.00, +0.02) in H_2O and at the *airflow-control setting* used at *full compressor speed*. If the ratio in 6.1.5.2 is exceeded, determine the appropriate *airflow-control settings* to achieve the ESP tolerance while not exceeding this ratio.

6.1.5.2.5 *MIB Systems.* Obtain the full airflow with all indoor blowers operating unless prevented by the controls of the unit. In such cases, turn on the maximum number of indoor blowers permitted by the unit's controls. Where more than one option exists for meeting this "on" indoor blower requirement, which indoor blower(s) are turned on must match that *specified* in the certification report. Section 6.1.5.2 shall apply to each indoor blower separately. If two or more indoor blowers are connected to a common duct, temporarily divert their air volume to the test room when confirming or adjusting the setup configuration of individual indoor blowers. The allocation of the system's full airflow assigned to each "on" indoor blower must match the *specified* value by the manufacturer.

6.1.5.3 *Cooling Low Airflow*. The manufacturer shall have *specified* the cooling low airflow, $Q_{B,Low}$. The *specified* cooling low airflow value shall be utilized for all tests that call for cooling low airflow unless the measured low airflow, when divided by the measured indoor air-side *total cooling capacity*, exceeds 50 scfm per 1,000 Btu/h or otherwise modified by the following subsections. If this ratio is exceeded, or if there is no

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specified cooling low airflow, reduce the low airflow until this ratio is equaled. If modified, that same modified value shall be utilized for all tests that call for cooling low airflow.

6.1.5.3.1 *Coil-only Systems*. For *two-stage systems* and *variable capacity systems*, the manufacturer *specified* cooling low airflow shall not be less than 65% of the cooling full airflow, otherwise the 65% of the cooling full air flow shall be utilized. This cooling low airflow shall be utilized regardless of the pressure drop across the indoor coil assembly.

6.1.5.3.2 *PSC AMS or Constant-torque AMS Ducted Systems*. The *specified* cooling low airflow shall not cause the ESP during the B_{Low} test to go below the minimum values calculated by Equation 6.3 For all other tests, the cooling low airflows *specified* by the manufacturer shall be run at the same airflow as the B_{Low} test. For products that do not have automatic control of *airflow-control settings*, the manual *airflow-control setting* from cooling full airflow shall remain unchanged.

For products that allow independent *airflow-control settings*, all *low stage* cooling tests shall be performed at cooling low airflow at the lowest *airflow-control setting* that meets the *low stage* minimum ESP per Equation 6.3. Refer to Section 6.1.5.1.7.

6.1.5.3.3 *Constant-volume AMS Ducted Systems*. All tests requiring cooling low airflow shall be performed at the minimum ESP values identified in Equation 6.3 (-0.00,+0.03) in H_2O using the manufacturer's *specified airflow-control setting*. If the manufacturer has not *specified* an *airflow-control setting*, the manufacturer's airflow tables shall be used to determine the appropriate *airflow-control setting*. Refer to Section 6.1.5.1.3 and 6.1.5.1.7.

6.1.5.3.4 *Ducted Systems Having MIB*. For *ducted systems* having *multiple indoor blowers (MIB)* within a single indoor section, operate the indoor blowers such that the lowest airflow allowed by the unit's controls is obtained when operating the lone single-speed compressor or when operating at *low compressor stage* while meeting the requirements of Section 6.1.5.3 for the minimum number of blowers that must be turned off. Minimum ESP shall use the procedure described in Section 6.1.5.1.2. The sum of the individual "on" indoor blowers' airflows is the cooling minimum airflow for the system.

6.1.5.3.5 *Non-ducted Systems.* The cooling low airflow is the airflow that results during each test when the unit is operated at an ESP of 0.00 (-0.00, +0.02) in H_2O and at the indoor blower setting used at *low compressor stage* (*two-capacity system*) or minimum compressor speed (variable-speed system). For units having a single-speed compressor and a variable-speed variable-air-volume-rate indoor blower, use the lowest fan setting allowed for cooling. Refer to Section 6.1.5.1.7. If the ratio in 6.1.5.3 is exceeded, determine the appropriate *airflow-control settings* to achieve the ESP tolerance while not exceeding this ratio.

6.1.5.4 *Cooling Intermediate Airflow*. The manufacturer shall have *specified* the cooling intermediate airflow, $Q_{E,Int}$. The *specified* cooling intermediate airflow value shall be utilized for all tests that call for cooling intermediate airflow unless, the measured intermediate airflow, when divided by the measured indoor air-side *total cooling capacity*, exceeds 50 scfm per 1,000 Btu/h, or otherwise modified by the following subsections. If this ratio is exceeded, or if there is no *specified* cooling intermediate airflow, reduce the intermediate airflow until this ratio is equaled.

6.1.5.4.1 *Coil-only Systems*. *Variable capacity coil-only systems* shall be run at the cooling low airflow.

6.1.5.4.2 *PSC AMS or Constant-torque AMS Ducted Systems*. The *specified* cooling intermediate airflow shall not cause the ESP during any test calling for cooling intermediate airflow to go below the minimum values calculated by Equation 6.3. For products that do not have automatic control of *airflow-control settings*, the manual *airflow-control setting* from cooling full airflow shall remain unchanged.

For products that allow independent *airflow-control setting* selection, all *intermediate compressor speed cooling* tests shall be performed at cooling intermediate airflow at the lowest *airflow-control setting* that meets the minimum ESP in Equation 6.3. Refer to Section 6.1.5.1.7.

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6.1.5.4.3 *Constant-volume AMS Ducted Systems*. All tests requiring cooling intermediate airflow shall be performed at the minimum ESP values calculated using Equation 6.3 (-0.00,+0.03) in H_2O. Refer to Section 6.1.5.1.3 and 6.1.5.1.8.

6.1.5.4.4 *Non-ducted Systems.* The cooling intermediate airflow is the airflow that results during each test when the unit is operated at an ESP of 0.00 (-0.00, +0.02) in H_2O. Refer to Section 6.1.5.1.8. If the ratio in 6.1.5.4 is exceeded, determine the appropriate *airflow-control settings* to achieve the ESP tolerance while not exceeding this ratio.

6.1.5.5 *Heating Full Airflow.* The manufacturer shall have *specified* a heating full airflow, $\dot{Q}_{H1,Full,}$ except as required by 6.1.5.5.1. The *specified* heating full airflow value shall be utilized for all tests that call for heating full airflow, unless otherwise modified by the following subsections. If modified, that same modified value shall be utilized for all tests that call for heating full airflow. Unless otherwise indicated, static pressure requirements only apply to the $H1_{Full}$ test.

6.1.5.5.1 *Ducted Heat Pumps where the Heating Full Airflow and Cooling Full Airflow are the Same.* Use the cooling full airflow as the heating full airflow for:

6.1.5.5.1.1 *Coil-only heat pumps* (except *two-capacity northern heat pumps* tested only at low capacity in cooling – see Section 6.1.5.5.5), or

6.1.5.5.1.2 *PSC AMS* or *constant-torque AMS* ducted *heat pumps* which operate at the same indoor *airflow-control setting* during both A_{Full} and $H1_{Full}$ tests, or

6.1.5.5.1.3 *Constant-volume AMS* ducted *heat pumps* which deliver the same airflow during both the A_{Full} and $H1_{Full}$ tests.

No ESP requirements apply for *heat pumps* of Sections 6.1.5.5.1.1 and 6.1.5.5.1.2. Use the final indoor blower control settings as determined when setting the cooling full airflow, and readjust the exhaust fan of the airflow measuring apparatus if necessary to reset to the cooling full airflow obtained in Section 6.1.5.2. For *heat pumps* where Section 6.1.5.5.1.3 is applicable, test at the minimum ESP identified in Table 10 (0.00 to +0.03 in H_2O). If the static pressure exceeds the minimum or targeted ESP by +0.03 in H_2O, or the setting causes airflow variations (Q_{var}) more than 10% or an automatic shutdown of the indoor blower, then use procedure from Section 6.1.5.1.3.

6.1.5.5.2 *PSC AMS or Constant-torque AMS Ducted Heat Pumps where the Heating Full Airflow and Cooling Full Airflows are Different Due to Automatic Indoor Fan or Controls Operation.* The *specified* heating full airflow shall not cause the ESP during any test calling for heating full airflow to go below the minimum values identified in Equation 6.3. Refer to Section 6.1.5.1.7.

6.1.5.5.3 *Constant-volume AMS Ducted Heat Pumps where the Heating Full Airflow and Cooling Full Airflows are Different Due to Automatic Indoor Fan or Controls Operation*. All tests shall be performed at the minimum ESP values identified in Equation 6.3 (-0.00,+0.03) in H_2O.

6.1.5.5.4 *Ducted Two-capacity Northern Heat Pumps and Ducted Triple-capacity Northern Heat Pumps*. Select the appropriate approach from 6.1.5.5.2 or 6.1.5.5.3 cases above for units that are tested with an indoor fan installed. For *coil-only northern heat pumps*, the heating full airflow is the lesser of the rate *specified* by the manufacturer or 133% of the cooling full airflow. For this latter case, obtain the heating full airflow regardless of the pressure drop across the indoor coil assembly.

6.1.5.5.5 *Heating-only Coil-only Heat Pumps*. The manufacturer *specified* heating full airflow shall not cause the pressure drop across the indoor coil during the $H1_{Full}$ to exceed 0.30 in H_2O. If the maximum static is exceeded, reduce airflow until maximum static is achieved. Use this reduced airflow for all tests that require the heating full airflow.

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6.1.5.5.6 *PSC AMS or Constant-torque AMS Ducted Heating-Only Heat Pumps*. The manufacturer *specified* heating full airflow shall not cause the ESP during the $H1_{Full}$ to go below the minimum values identified in Table 10. Refer to Section 6.1.5.1.6.

6.1.5.5.7 *Constant-volume AMS Ducted Heating-Only Heat Pumps*. The manufacturer *specified* heating full airflow shall be performed at the minimum values identified in Table 10 (-0.00,+0.03) in H_2O.

6.1.5.5.8 *Non-ducted Heat Pumps*. The heating full airflow is the airflow that results during each test when the unit is operated at an ESP of 0.00 (-0.00, +0.02) in H_2O. Refer to Section 6.1.5.1.8

6.1.5.5.9 *Ducted Systems where the Heating Full Airflow and Cooling Full Airflows are Different Due to Controls*. For *ducted systems* having *multiple indoor blowers (MIB)* within a single indoor section, obtain the heating full airflow using the same "on" indoor blowers as used for the Cooling full airflow. Using the target ESP and the *specified* airflows, follow the procedures as described in Section 6.1.5.5.2 if the indoor blowers are not constant-air-volume indoor blowers or as described in Section 6.1.5.5.3 if the indoor blowers are constant-air-volume indoor blowers. The sum of the individual "on" indoor blowers' airflows is the heating full airflow for the system.

6.1.5.5.10 *Ducted Systems where the Heating Full Airflow and Cooling Full Airflows are Different Due To Indoor Blower Operation*. For *ducted systems* with *multiple indoor blowers (MIB)* within a single indoor section, obtain the heating minimum airflow using the same "on" indoor blowers as used for the cooling minimum airflow. Using the target ESP and the *specified* airflows, follow the procedures as described in Section 6.1.5.5.2 if the indoor blowers are not constant-air-volume indoor blowers or as described in Section 6.1.5.5.3 if the indoor blowers are constant-air-volume indoor blowers. The sum of the individual "on" indoor blowers' airflows is the heating full airflow for the system.

6.1.5.5.11 *Variable capacity Coil-only Systems*. *Variable capacity coil-only systems* shall be run at the cooling full airflow.

6.1.5.6 *Heating Low Airflow*. The manufacturer shall have *specified* a heating low airflow except as required by Section 6.1.5.6.1. The *specified* heating low airflow value shall be utilized for all tests that call for heating low airflow, unless otherwise modified by the following subsections. If modified, that same modified value shall be utilized for all tests that call for heating low airflow.

6.1.5.6.1 *Ducted Heat Pumps where the Heating Low Airflow and Cooling Low Airflow are the Same.* Use the cooling low airflow as the heating low airflow for:

6.1.5.6.1.1 *Coil-only Heat Pumps*, or

6.1.5.6.1.2 *PSC AMS* or *constant-torque AMS* ducted *heat pumps* which operate at the same *airflow-control setting* during both B_{Low} and $H1_{Low}$ tests, or

6.1.5.6.1.3 *Constant-volume AMS* ducted *heat pumps* which deliver the same airflow during both the B_{Low} and $H1_{Low}$ tests.

For Sections 6.1.5.6.1.1 and 6.1.5.6.1.2, use the final indoor blower control settings as determined when setting the cooling minimum airflow, and readjust the exhaust fan of the airflow measuring apparatus if necessary to reset to the cooling minimum airflow obtained in Section 6.1.5.3. For *heat pumps* where Section 6.1.5.6.1.3 is applicable, test at the minimum ESP as was identified for the B_{Low} cooling mode test (-0.00 to +0.03 in H_2O). If the static pressure exceeds the minimum or targeted ESP by +0.03 in H_2O, or the setting causes airflow variations (Qvar) more than 10% or an automatic shutdown of the indoor blower, then use procedure from Section 6.1.5.1.3.

6.1.5.6.2 *PSC AMS or Constant-torque AMS Ducted Heat Pumps where the Heating Low Airflow and Cooling Low Airflows are Different Due to Automatic Indoor Fan or Controls Operation.* For the initial test requiring the heating low airflow, the *specified* heating low airflow shall not cause the ESP to go below the minimum values identified in Equation 6.3. Refer to Section 6.1.5.1.7. For all subsequent tests requiring the heating low airflow, use the same heating low airflow

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from the initial test requiring the heating low airflow.

6.1.5.6.3 *Constant-volume AMS Ducted Heat Pumps where the Heating Low Airflow and Cooling Low Airflows are Different Due to Automatic Indoor Fan or Controls Operation*. All tests requiring heating low airflow shall be performed at the minimum ESP values identified in Equation 6.3 (-0.00,+0.03) in H_2O. Refer to Section 6.1.5.1.3 and 6.1.5.1.8

6.1.5.6.4 *Non-ducted Heat Pumps, Including Non-ducted Heating-only Heat Pumps*. The heating low airflow is the airflow that results during each test when the unit operates at an ESP of 0.00 (-0.00, +0.02) in H_2O and at the indoor blower setting used at *low compressor stage* (*two-capacity system)* or minimum compressor speed (variable-speed system). For units having a single-speed compressor and a variable-speed, variable-air-volume-rate indoor blower, use the lowest fan setting allowed for heating. Refer to Section 6.1.5.1.8.

6.1.5.6.5 *Ducted Two-capacity Northern Heat Pumps and Ducted Triple Capacity Northern Heat Pumps*. Select the appropriate approach from 6.1.5.6.2 or 6.1.5.6.3 cases above for units that are tested with an indoor fan installed. For *coil-only heat pumps*, the heating low airflow is the higher of cooling full airflow or 65% of the heating full airflow. For *coil-only heat pumps*, obtain the heating low airflow regardless of the pressure drop across the indoor coil assembly.

6.1.5.6.6 *Heating-only Coil-only Heat Pumps.* The manufacturer *specified* heating low airflow shall not be less than 65% of the heating full airflow.

6.1.5.6.7 *PSC AMS or Constant-torque AMS Ducted Heating-Only Heat Pumps*. The manufacturer *specified* heating low airflow shall not cause the ESP during any *low stage* heating test to go below the minimum values calculated from Equation 6.3.

6.1.5.6.8 *Constant-volume AMS Ducted Heating-Only Heat Pumps*. The manufacturer *specified* heating low airflow shall be performed at the minimum values calculated from Equation 6.3 (-0.00,+0.03) in H_2O.

6.1.5.6.9 *Variable capacity Coil-only Systems*. *Variable capacity coil-only systems* shall run at the cooling low airflow.

6.1.5.7 *Heating Intermediate Airflow.* The manufacturer shall have *specified* a heating intermediate airflow except as required by 6.1.5.7.1. The *specified* heating intermediate airflow value shall be utilized for all tests that call for heating intermediate airflow, unless otherwise modified by subsections of Section 6.1.5.7. If modified, that same modified value shall be utilized for all tests that call for heating intermediate airflow. If there is no *specified* heating intermediate airflow, use the final indoor blower control settings as determined when setting the heating full airflow, and readjust the exhaust fan of the airflow measuring apparatus if necessary to reset to the cooling full air volume obtained in Section 6.1.5.2. Calculate the target minimum ESP as described in Section 6.1.5.2.

6.1.5.7.1 *Coil-only heat pumps* where the heating intermediate airflow and cooling intermediate airflow are the same. See Section 6.1.5.4.1.

6.1.5.7.2 *PSC AMS* or *constant-torque AMS* Ducted Systems. The *specified* heating intermediate airflow shall not cause the ESP during any test calling for heating intermediate airflow to go below the minimum values identified in Equation 6.3. Refer to Section 6.1.5.1.7.

6.1.5.7.3 *Constant-volume AMS Ducted Systems*. All tests requiring heating intermediate airflow shall be performed at the minimum ESP values identified by Equation 6.3 (-0.00,+0.03) in H_2O. Refer to Section 6.1.5.1.7 and 6.1.5.1.8.

6.1.5.7.4 *Non-ducted Heat Pumps, Including Non-ducted Heating-only Heat Pumps*. The heating intermediate airflow is the airflow that results during each test when the unit operates at an ESP of 0.00 (-0.00, +0.02) in H_2O and at the fan speed selected by the controls of the unit for the $H2_{Int}$ Test conditions. Refer to Section 6.1.5.1.8

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6.1.5.7.5 *Variable Capacity Coil-only Systems*. *Variable capacity coil-only systems* shall run at the cooling low airflow.

6.1.5.8 *Heating Nominal Airflow*. The manufacturer shall have *specified* a heating nominal airflow and the instructions for setting fan speed and controls. The *specified* heating nominal airflow value shall be utilized for all tests that call for heating nominal airflow, except as noted below. If modified, that same modified value shall be utilized for all tests that call for heating nominal airflow. For *variable capacity coil-only systems*, the heating nominal airflow will be the same as the cooling full airflow.

The *specified* heating nominal airflow shall not cause the ESP during any test calling for heating nominal airflow to go below the minimum values identified in Equation 6.3.

6.1.5.9 *MIB Airflow*. For any test where a *MIB* system is operated at its lowest capacity—i.e., the lowest total airflow allowed when operating the single-speed compressor or when operating at *low compressor stage*—turn off indoor blowers accounting for at least one-third of the full airflow unless prevented by the controls of the unit. In such cases, turn off as many indoor blowers as permitted by the unit's controls. Where more than one option exists for meeting this "off" requirement, the manufacturer must indicate in its certification report which indoor blower(s) are turned off. The chosen configuration shall remain unchanged for all tests conducted at the same lowest capacity configuration. For any indoor coil turned off during a test, cease forced airflow through any outlet duct connected to a switched-off indoor blower.

6.1.6 *Outdoor Coil Airflow*. All *standard ratings* shall be determined at the *outdoor coil* airflow *specified* by the manufacturer where the fan drive is adjustable. Where the fan drive is non-adjustable, performance shall be determined at the *outdoor coil* airflow inherent in the equipment when operated with all of the resistance elements associated with inlets, louvers, ductwork, plenums, and attachments considered by the manufacturer as normal installation practice, as determined by the manufacturer literature. Once established, the *outdoor coil* air circuit of the equipment shall remain unchanged throughout all tests prescribed herein.

6.1.6.1 *Double-duct System*. For products intended to be installed with the outdoor airflow ducted, the unit shall be installed with *outdoor coil* ductwork installed per the *installation instructions* and shall operate between 0.10 and 0.15 in H_2O ESP. ESP measurements shall be made in accordance with ASHRAE Standard 37 Sections 6.4 and 6.5.

6.1.7 *Control of Auxiliary Resistive Heating Elements*. Except as noted, disable *heat pump* resistance elements used for heating indoor air at all times, including during *defrost cycles* and non-defrost tests for units with a *heat comfort controller*. For *heat pumps* equipped with a *heat comfort controller*, enable the *heat pump* resistance elements only during the below-described short test. The short test follows the $H1_{Full}$ test or, if conducted, the $H1C_{Full}$ test. Set the *heat comfort controller* to provide the maximum supply air temperature. With the *heat pump* operating and while maintaining $Q_{H1\text{-}Full}$, measure the temperature of the air leaving the indoor-side beginning 5 minutes after activating the *heat comfort controller*. Sample the outlet dry-bulb temperature at regular intervals that span 5 minutes or less. Collect data for 10 minutes, obtaining at least 3 samples. Measure the outlet temperature (T_{cc}), °F, averaged over the 10-minute interval.

6.1.8 *Tested Combinations or Tested Units.* As a minimum, *tested combinations* of *split systems* or tested samples of *single package unit* shall include the following combination for the specific types of equipment listed. Unless otherwise stated below, there is no restriction on the *tested combination* (i.e., *single-split air-conditioners* and *single-split heat pumps* not listed below shall be tested as a *coil-only system* or a *blower coil system*).

6.1.8.1 *Single Stage Air-conditioner (Distributed in commerce by an OUM)*. Any *single stage air-conditioner* (including *space constrained products* and *SDHV*) shall be tested, as a minimum, as a *coil-only system*.

6.1.8.2 *Two-stage Air-conditioner (Distributed in commerce by an OUM)*. Any *two-stage air-conditioner* (including *space constrained products* and *SDHV*) shall be tested, as a minimum, as a *coil-only system*.

6.1.8.3 *Single-Split System Air-conditioner (Distributed in Commerce by an ICM)*. Manufacturers shall test a model of *indoor unit* with the least efficient model of *outdoor unit* with which it shall be paired where the least efficient model of *outdoor unit* is the model of *outdoor unit* in the lowest *SCORE* combination as *specified* by the *OUM*. If there are multiple models of *outdoor unit* with the same lowest *SCORE* represented value, the *ICM* shall select one for testing purposes.

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6.1.8.4 *Single-Split System Heat Pump (Distributed in Commerce by an ICM)*. Does not need to be tested as long as an equivalent *air-conditioner* basic model has been tested. If an equivalent model has not been tested, manufacturers shall test a model of *indoor unit* with a model of *outdoor unit* meeting the same requirements listed as in Section 6.1.8.3 for *single-split air-conditioner* distributed in commerce by an *ICM*.

6.1.8.5 *Multi-split, Multi-Head Mini-Split, or Multiple-Circuit System (including Space Constrained Products and SDHV)*. (See also Section 6.4.1.1.). An arrangement of *indoor units* and *outdoor units* that are production units, or are representative of production units and provides representative performance values, having the following features:

6.1.8.5.1 The system consists of one *outdoor unit* with one or more compressors matched with at least two but no more than five *indoor units*;

6.1.8.5.2 The *indoor units* shall:

6.1.8.5.2.1 Collectively, have a *nominal cooling capacity* greater than or equal to 95% and less than or equal to 105% of the *nominal cooling capacity* of the *outdoor unit* ;

6.1.8.5.2.2 Each represent the highest sales volume model family (at the time the rating is established), if this is possible while meeting all the requirements of this section. If this is not possible, one or more of the *indoor units* shall represent another indoor model family in order that all the other requirements of this section are met.

6.1.8.5.2.3 Individually not have a *nominal cooling capacity* greater than 50% of the *nominal cooling capacity* of the *outdoor unit*, unless the *nominal cooling capacity* of the *outdoor unit* is 24,000 Btu/h or less;

6.1.8.5.2.4 Operate at fan speeds consistent with manufacturer's specifications; and

6.1.8.5.2.5 All be subject to the same minimum ESP requirement while able to produce the same ESP at the exit of each outlet plenum when connected in a manifold configuration as required by the test procedure.

6.1.8.6 *Outdoor Unit with No Match*. The model of *outdoor unit* shall be tested with a model of *coil-only indoor unit* meeting the requirements of Section 5.1.6.2.

6.1.8.7 *Single Package Air-conditioners and Heat Pumps (Including Space Constrained Products) Selected for Testing.* Manufacturers shall test the individual model with the lowest *SCORE*.

6.2 *Application Ratings.* Ratings at conditions of temperature or airflow other than those identified in Sections 6.1.3 may be published as *application ratings*, and shall be based on data determined by the methods prescribed in Section 6.4.1 or Section 6.4.2. *Application ratings* in the defrost region shall include *net capacity* and *COP* based upon a complete *defrost cycle* (instantaneous capacity may be provided as long as *net capacity* is also provided).

6.2.1 *International Ratings.*

6.2.1.1 *Cooling Temperature Conditions*.

6.2.1.1.1 The T1, T2, and T3 temperature conditions identified in Table 11 shall be considered *rating conditions* for the determination of cooling capacity and energy efficiency.

6.2.1.1.2 Equipment manufactured for use only in a moderate climate similar to that identified in Column T1 of Table 11 shall have ratings at T1 conditions and shall be designated type T1 equipment.

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6.2.1.1.3 Equipment manufactured for use only in a cool climate similar to that identified in Column T2 of Table 11 shall have ratings at T2 conditions and shall be designated type T2 equipment.

6.2.1.1.4 Equipment manufactured for use only in a hot climate similar to that identified in Column T3 of Table 11 shall have ratings at T3 conditions and shall be designated type T3 equipment.

6.2.1.1.5 Equipment manufactured for use in more than one of the climates defined in Table 11 shall have marked on the nameplate the designated type (T1, T2, and/or T3). The corresponding ratings shall be determined by the *rating conditions* identified in Table 11.

6.2.1.2 *Heating Temperature Conditions*.

6.2.1.2.1 The H1, H2, and H3 temperature conditions identified in Table 11 shall be considered *rating conditions* for the determination of heating capacity and energy efficiency.

6.2.1.2.2 All *heat pumps* shall be rated at the H1 temperature conditions.

6.2.1.2.3 Equipment manufactured for use in more than one of the climates defined in Table 11 shall have marked on the nameplate the designated type (H1, H2, and/or H3). The corresponding ratings shall be determined by the *rating conditions* identified in Table 11.

Table 11. Application Rating Conditions for I-P Standards[1]

Cooling – Standard Temperature Conditions	T1 (Moderate Climates)	T2 (Cool Climates)	T3 (Hot Climates)
Indoor	80.6°F DB & 66.2°F WB	69.8°F DB & 59.0°F WB	84.2°F DB & 66.2°F WB
Outdoor	95.0°F DB & 75.2°F WB	80.6°F DB & 66.2°F WB	114.8°F DB & 75.2°F WB
Cooling – Maximum Temperature Conditions	T1 (Moderate Climates)	T2 (Cool Climates)	T3 (Hot Climates)
Indoor	89.6°F DB & 73.4°F WB	80.6°F DB & 66.2°F WB	89.6°F DB & 73.4°F WB
Outdoor	109.4°F DB & 78.8°F WB	95.0°F DB & 75.2°F WB	125.6°F DB & 73.4°F WB
Heating – Standard Temperature Conditions	H1 – (Warm Climates)	H2 – (Moderate Climates)	H3 - (Cold Climates)
Indoor	68.0°F DB and 59.0°F WB max.	68.0°F DB & 59.0°F WB max.	68.0°F DB and 59.0°F WB max.
Outdoor	44.6°F DB and 42.8°F WB	35.6°F DB & 33.8°F WB	19.4°F DB & 17.6°F WB
Heating – Maximum Temperature Conditions	H1 – (Warm Climates)	H2 – (Moderate Climates)	H3 - (Cold Climates)
Indoor	75.2°F DB and 64.4°F WB		
Outdoor	80.6°F DB		

Note 1: DB = dry-bulb temperature and WB = wet-bulb temperature.

6.3 *Publication of Ratings.* Wherever *application ratings* are published or printed, they shall include, or be accompanied by the *standard ratings*, shall be clearly designated as *application ratings*, including a statement of the conditions at which the ratings apply.

6.3.1 *Capacity Designation.* The capacity designation used in published specifications, literature or advertising, controlled by the manufacturer, for equipment rated under this standard, shall be expressed only in Btu/h at the *standard rating conditions* identified in 6.1.3 and in the terms described in 6.1.1 and 6.1.2. Horsepower, tons or other units shall not be used as capacity designation.

6.4 *Ratings. Standard ratings* for capacity, *EER*, *SCORE*, and *SHORE* shall be based either on test data or computer simulation. For three-phase systems refer to Appendix F.

6.4.1 Note that DOE requires represented values for individual models, individual combinations, and *tested combinations* as identified in 10 CFR 429.16(a)(1). For consistency, this also applies to *standard ratings*:

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6.4.1.1 *Single-package Air-conditioners and Single-package Heat Pumps (Including Space Constrained Products).* Manufacturers shall determine represented values for every individual model distributed in commerce.

6.4.1.2 *Single-split Air-conditioners with Single Stage Compressors or Two-stage Compressors (Including Space Constrained Products and SDHV) Distributed in Commerce by an OUM.* Manufacturers shall determine represented values for every individual combination distributed in commerce. For each model of *outdoor unit*, this shall include at least one *coil-only system* that is representative of the least efficient combination distributed in commerce with that particular model of *outdoor unit*.

Note: Additional representations for *blower coil systems* may be made for any applicable individual combinations, if distributed in commerce.

6.4.1.3 *Single-split Air-conditioners with Other Than Single Stage Compressors or Two-stage Compressors (Including Space Constrained Products and SDHV) Distributed In Commerce By An OUM*. Manufacturers shall determine represented values for every individual combination distributed in commerce, including all *coil-only systems* and *blower coil system*.

6.4.1.4 *Single-split Heat Pumps (Including Space Constrained Products and SDHV) distributed in commerce by an OUM*. Manufacturers shall determine represented values for every individual combination distributed in commerce. If a manufacturer offers combinations of both *coil-only systems* and *blower coil systems*, represented values shall be required for both.

6.4.1.5 *Single-split Air-Conditioners and Single-split Heat Pumps (Including Space Constrained Products and SDHV) distributed in commerce by an ICM*. Manufacturers shall determine represented values for every individual combination distributed in commerce.

6.4.1.6 *Outdoor Unit With No Match.* Manufacturers shall determine represented values for every model of *outdoor unit* distributed in commerce (tested with a model of *coil-only indoor unit* as identified in 10 CFR 429.16(b)(2)(i)).

6.4.1.7 *Multi-split, Multi-circuit System or Multi-head Mini-split (Including SDHV and Space Constrained Products).* See Section 6.4.3.3.

6.4.2 *Refrigerants.*

6.4.2.1 If a model of Outdoor Unit (used in a *single-split system*, *multi-split system*, *multi-circuit system*, *multi-head mini-split system*, and/or *outdoor unit* with no match system) is distributed in commerce and approved for use with multiple refrigerants, a manufacturer shall determine *standard ratings* for that model using each refrigerant that can be used in an individual combination of the basic model (including *outdoor units* with no match (*OUWNM*)or "*tested combinations*"). This requirement shall apply across the listed categories in the table in paragraph (a)(1) of 10 CFR 429.16. A refrigerant is considered approved for use if it is listed on the nameplate of the *outdoor unit*. If any of the refrigerants approved for use is HCFC-22 or has a 95°F midpoint saturation absolute pressure that is ± 18% of the 95°F saturation absolute pressure for HCFC-22, or if there are no refrigerants designated as approved for use, a manufacturer shall determine represented values (including *SCORE*, *EER*, *SHORE*, cooling capacity, and heating capacity, as applicable) for, at a minimum, an *outdoor unit* with no match (*OUWNM*). If a model of *outdoor unit* is not charged with a *specified* refrigerant from the point of manufacture or if the unit is shipped requiring the addition of more than two pounds of refrigerant to meet the charge required for the A_{Full} test per Table 8 when charged per Section 5.1.8 (unless either (a) the factory charge is equal to or greater than 70% of the *outdoor unit* internal volume times the liquid density of refrigerant at 95°F or (b) an A2L refrigerant is approved for use and listed in the certification report), a manufacturer shall determine *standard ratings* (including *SCORE*, *EER*, *SHORE*, cooling capacity, and heating capacity, as applicable) for, at a minimum, an *outdoor unit* with no match (*OUWNM*).

6.4.2.2 If a model is approved for use with multiple refrigerants, *standard ratings* shall be either a) multiple *standard ratings*, with one *standard rating* provided for the performance of the model with each individual refrigerant or b) if a single *standard rating* is to be provided the least-efficient refrigerant shall be used to create the *standard rating*. A single *standard rating* made for multiple refrigerants may not include equipment in multiple categories or equipment subcategories listed in the table in paragraph 10 CFR 429.16(a)(1).

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