



ASHRAE Standard 205P
Public Review Draft

Representation of Performance Data for
HVAC&R and Other Facility Equipment

Fourth Public Review (July 2022)

(Draft shows only proposed Independent Substantive Changes to Previous Public Review Draft)

This draft has been recommended for a public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website <http://www.ashrae.org/public-review-drafts> and access the online comment database.

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This is a review of Independent Substantive Changes that were made since the last public review. Text that was removed from the Public Review Draft is provided for reference but is shown in ~~strikeout~~, and text that has been added is shown with underlines.

Only these changes are open to comment at this time. All other material is provided for context only and is not open for Public Review comment except as it relates to the proposed changes.

Section 3, Definitions: modify and add the definitions below for clarification

data element: a named data item of a single value, primitive data type (e.g., Integer, Numeric, Boolean) or a single object comprised of ~~multiple data elements contained within a data group~~ with an explicit data type.

data type: an attribute that specifies how to interpret the value of the data (see Section 5.3 for data type definitions).

Section 4, Representation Content: make the changed content mandatory

The representation shall be a file conforming to the CBOR data serialization format¹ that (1) is valid according to the ASHRAE 205 JSON schema and (2) passes all verification rules specified in the representation specification.

Representation files shall be named xxxx.a205.cbor, where xxxx is a suitable identifier chosen by the data publisher for the equipment whose performance is represented in the file.

Informative note: To be valid against the ASHRAE 205 JSON schema, the representation ~~must~~ shall be correctly formatted and pass all constraint checks.

Section 5.1, Data Group Composition: make the changed content mandatory

5.1 Data Group Composition. A data group is a collection of data elements as specified in this standard.

Informative Note 1: Standard 205 data groups ~~cannot~~ shall not be extended except via modification of the standard.

Informative Note 2: Representation files containing data elements or data groups not defined in this standard will not validate against the ASHRAE 205 JSON schema.

Table 5-1, Data Element Attributes: add the text for clarification

Table 5–1 Data Element Attributes

Attribute	Description	Notes
Name	Public name of <u>data</u> element	See Section 7.3
Description	Text description that defines the meaning of the <u>data</u> element	
Data Type	Data type of <u>data</u> element	See Section 5.3
Units	Units of <u>data</u> element	See Section 5.4
Constraints	A list of constraints on the data element value that can be verified against the schema	See Section 5.5
Required (abbreviated as Req)	Indicates whether <u>data</u> element is mandatory <u>when containing data group is present in a representation</u>	See Section 5.6

Notes	Any supplementary information
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Table 5-2, Fundamental Data Type Definitions: add the text to clarify numbers are base 10

Table 5–2 Fundamental Data Type Definitions

Data Type	Description	JSON Schema Type	Examples
Integer	A positive or negative, <u>base 10</u> whole number (i.e., a number that can be written without a fractional part).	integer	3, 19, -4
Numeric	A <u>base 10</u> number that may include a fractional part with optional leading sign and optional exponent (engineering notation). Numeric values are conveyed in CBOR files in IEEE 754 ⁴ binary64 format without rounding.	number	3.43, 0, -4, 1.03e4
Boolean	True or false.	boolean	true, false
String	A sequence of characters of any length using any (specified) character set.	string	Indirect evaporative cooler
Null	Used to represent a missing value. Shall only be used in combination with other data types, e.g., Numeric/Null.	null	null

Section 5.4, Units: changes for clarification

5.4 Units.

5.4.1 General Requirements. Except as specified in Section 5.4.1, all numeric values shall be represented in SI units as specified in ASHRAE SI policy documents⁹. Base units shall be used (e.g., temperature shall be expressed in degrees Kelvin and time shall be expressed in seconds). Any unit conversions needed for preparing or using representation data shall be done using conversion factors specified in ASHRAE SI policy. When no appropriate conversion factor is specified in ASHRAE SI policy, it shall be described in the data element descriptive text including conversion factors.

5.4.1 Non-SI Units. Units other than SI are required or permitted in the following situations:

- Ratings. Standard rating values shall be published using the units specified in the rating definition. For example, SEER shall be published in Btu/W·h.
- Descriptive text. Values included in descriptive text or documentation data elements are permitted to be given in any units, and the units used shall be stated.

5.4.2 Units in Representation Specification Documentation.

Units of all values in all representation specifications shall be documented using symbols defined below. If a numeric data element does not have units, the hyphen "-" character shall be used for its units.

When combining base units into derived units, the following rules shall apply:

- For a symbol raised to a power use the power as an exponent (e. g. m²).
- For the product of two symbols use the interpoint "." (e. g. N·m).
- For the quotient of two symbols use the solidus "/" (e. g. W/m²·K)

- Use only one solidus symbol per derived unit (e.g., m/s², not m/s/s).
- Do not use parentheses (e.g., W/m²·K, not W/(m²·K)).
- Do not use negative exponents (e.g., W/m²·K, not W·m⁻²·K⁻¹).

5.4.3 Units in JSON Schema.

Units of all values in JSON schema shall be documented using symbols defined below.

If a numeric data element does not have units, the hyphen "-" character shall be used for its units. When combining base units into derived units, the following rules shall apply:

- For a symbol raised to a power use the symbol followed by the power (e. g. m2).
- For the product of two symbols use the hyphen "-" (e. g. N-m).
- For the quotient of two symbols use the solidus "/" (e. g. W/m2-K)
- Use only one solidus symbol per derived unit (e.g., m/s2, not m/s/s).
- Do not use parentheses (e.g., W/m2-K, not W/(m2-K)).
- Do not use negative exponents (e.g., W/m2-K, not W-m-2-K-1).

~~Any unit conversions needed for preparing or using representation data shall be done using conversion factors specified in ASHRAE SI policy. When no appropriate conversion factor is specified in ASHRAE SI policy, it shall be described in the data element descriptive text including conversion factors.~~

~~5.4.2 Non-SI Units. Units other than SI are required or permitted in the following situations~~

- ~~• Ratings. Standard rating values shall be published using the units specified in the rating definition. For example, SEER shall be published in Btu/W-h.~~
- ~~• Descriptive text. Values included in descriptive text or documentation data elements are permitted to be given in any units and the units used shall be stated.~~

Section 5.6, Required Data Elements: addition for clarification

5.6 Required Data Elements. The "Required" data element attribute is used to indicate the conditions where a data element value is required if the containing data group is present in a representation. If the data element is never required, the "Required" data element attribute shall be left blank. The following conditions are allowed.

Section 5.6.4, Combining Prerequisite Conditions: section added for clarity

5.6.4 Combining Prerequisite Conditions. When multiple prerequisite conditions are needed to define when a data element is required, these conditions may be combined using and and/or or and grouped as needed with parentheses. Combined conditions begin with a single if.

Informative note: Example: if (prerequisite and option_type=OPTION A) or option_type=OPTION B.

Section 5.7.3, Common Enumeration SpeedControlType: changes for generalization

5.7.3 CompressorSpeedControlType.

Enumerator	Description
DISCRETE	Compressor loading Loading is controlled by cycling between one or more discrete stages
CONTINUOUS	Compressor loading Loading is controlled by continuously varying the speed of the compressor

Section 6, Representation Specification Structure: addition for clarification

6 REPRESENTATION SPECIFICATION STRUCTURE

A representation specification shall consist of a single human-readable (e.g., PDF) document organized as specified in this section and appended to this standard as a normative appendix. The ASHRAE 205 JSON schema file(s) associated with each representation specification are deemed equivalent to the data definitions in the representation specification, allowing automated validation and manipulation of representation data.

A representation specification and normative supporting material available at <http://data.ashrae.org/standard205>, along with Standard 205, shall provide all required information for data publishers to prepare conforming representations and for application software developers to implement interface code to access and verify such information.

Informative note: Any number of informative supporting human- or machine- readable files may be provided for a representation specification at <http://data.ashrae.org/standard205>.

Section 6.1, Identification and History: correction to referencing

The `schema_version` shall be incremented using semantic versioning⁷ per Semver (2016) whenever there is a change to the Representation Specification data model.

Section 6.2.3, Embedded Representation: changes for clarification

6.2.3 Embedded Representations. A list of any representation specifications whose representations are referenced as data elements within the representation specification. The list shall include the schema type, the schema type description, and the fully qualified referencing data element. Representation specifications with no embedded representations shall indicate this by stating, "None".

Section 6.3.3.5, Rating: changes for clarification

6.3.3.5 Rating. If appropriate, a representation specification shall define data groups that includes data elements that represent standard ratings. If the equipment is certified according to a rating procedure, the rating data in the representation's description data group shall be consistent with the certified rating.

6.3.3.5.1 Recalculation of the Ratings with Performance Data. Consistency with Ratings. ~~Representation data need not be consistent with any published standard ratings unless such consistency is required by the associated representation specification.~~

If a representation specification includes a `Rating` data group, the data group shall contain a `Boolean` data element called `rating_recalculatable_from_performance_data` that denotes whether the performance data included in the

representation can be used to ~~reproduce~~ recalculate the published standard rating data in the data group within the tolerance of the rating standard used to determine the rating. The data group shall contain a string data element called rating recalculatable explanation to allow for an explanation of rating recalculatable from performace data.

Informative note: Representation data conveys typical performance at various operating conditions. Rating conditions and operating modes may or may not occur during installed operation. Standard 205 and ratings have different purposes; it is not possible to achieve consistency in all cases.

Section 6.3.3.9, LookupVariable: correct cross-reference

6.3.3.9 LookupVariables. Lookup variables values shall be defined as an array corresponding to all combinations of grid variable values. Lookup variables shall appear as an array ordered according to the listed order of grid variables in the data group `GridVariables`, with the value of last corresponding grid variable changing most rapidly. That is, the corresponding array for a lookup variable begins with the value corresponding to the first values of all grid variables, followed by the lookup variable value corresponding to the same grid variable values except using the second value of the last grid variable defined in the `GridVariables` data group. Consecutive lookup variable values correspond to cycling through the values of the last grid variable, followed by the second to last, and so on.

Informative note: See ~~Section~~ Appendix A for an example.

Section 6.8, Example(s): changes to make mandatory

6.8 Example(s). ~~Informative note:~~ Representation specifications ~~may~~ shall provide one or more examples to illustrate implementation.

Supporting files shall be made available at <http://data.asjrae.org/standard205>

Section 7.7, Pre-Existing Names (Informative): changes non-mandatory language

7.7 Pre-Existing Names (Informative). Instead of inventing new names, names from existing relevant schemas and data dictionaries should be used when appropriate. Table 7–15 provides a non-exhaustive list of related schemas and data dictionaries. When pre-existing names are adapted for Standard 205 use, they ~~shall~~ should be modified to conform to naming rules specified in this section.

Section RS0001.3.1, Data Group Hierarchy: additional informative note for clarity

RS0001.3.1 Data Group Hierarchy. A representation implementation conforming to this representation specification shall consist of the following data groups:

- RS0001
 - Metadata
 - Description*
 - ProductInformation*
 - RatingAHRI550590*
 - PartLoadRatingPoint550590*
 - RatingAHRI551591*
 - PartLoadRatingPoint551591*
 - Performance
 - PerformanceMapCooling
 - GridVariablesCooling
 - LookupVariablesCooling

- PerformanceMapStandby
- GridVariablesStandby
- LookupVariablesStandby

where * indicates data groups that are not required to be present in a representation conforming to this representation specification.

Informative Note: Required data elements of an optional data group are only required when the data group is present in a representation.

Informative Note: When multiple chillers are designed to operate in concert, such as in a series counterflow arrangement, the performance of the chiller system can be represented in a single file. Other designs with multiple chillers operating independently should be represented with multiple files.

Section RS0001.3.2.2, AHRI551591 TestStandardYear: additional enumerator

RS0001.3.2.2 AHRI551591TestStandardYear.

Enumerator	Description
SI_2015	Ratings and design points defined using SI unit version of the standard, 2015 edition ⁵
SI_2015_ADDENDUM_1	Ratings and design points defined using SI unit version of the standard, 2015 edition with Addendum 1 ⁶
SI_2018	Ratings and design points defined using SI unit version of the standard, 2018 edition ⁷
SI_2020	<u>Ratings and design points defined using SI unit version of the standard, 2020 edition⁸</u>

Section RS0001.3.3.4, RatingAHRI550590: data element changes for clarification

rating_reproducible recalculatable_from_performance_data	Whether this rating can be reproduced recalculated using the performance data in the representation	Boolean			✓	True if the rating values in this table can be reproduced recalculated using the performance data in the representation within the tolerance of the rating standard
rating_recalculatable_explanation	<u>An explanation of the value for rating_recalculatable_from_performance_data</u>	String				

Section RS0001.3.3.6, RatingAHRI551591: data element changes for clarification

<u>rating_reproducible</u> <u>recalculatable</u> <u>from</u> <u>performance</u> <u>data</u>	Whether this rating can be reproduced <u>recalculated</u> using the performance data in the representation	Boolean			✓	True if the rating values in this table can be reproduced <u>recalculated</u> using the performance data in the representation within the tolerance of the rating standard
<u>rating</u> <u>recalculatable</u> <u>explanation</u>	<u>An explanation of the value for</u> <u>rating</u> <u>recalculatable</u> <u>from</u> <u>performance</u> <u>data</u>	String				

Section RS0001.7, References: additional reference

RS0001.7 References.

1. AHRI. *ANSI/AHRI 550/590 (I-P) 2015: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2015.
2. AHRI. *ANSI/AHRI 550/590 (I-P) 2015 with Addendum 1: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2017.
3. AHRI. *ANSI/AHRI 550/590 (I-P) 2018 with Errata: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2018.
4. AHRI. *ANSI/AHRI 550/590 (I-P/2020): Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2020.
5. AHRI. *ANSI/AHRI 551/591 (SI/2020): Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2020.
6. AHRI. *ANSI/AHRI 551/591 (SI) 2015: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2015.
7. AHRI. *ANSI/AHRI 551/591 (SI) 2015 with Addendum 1: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2017.
8. AHRI. *ANSI/AHRI 551/591 (SI) 2018 with Errata: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2018.
9. ASHRAE. *Standard 34-2019: Designation and Safety Classification of Refrigerants*. Atlanta, Georgia: ASHRAE, 2019.

Section RS0002.2.3, Embedded Representations: clarifying information added

RS0002.2.3 Embedded Representations.

- ~~RS0003: Fan Assembly~~
- ~~RS0004: Air to Air Direct Expansion Coil System~~

<u>Schema Type</u>	<u>Schema Type Description</u>	<u>Data Element</u>
RS0003	Fan Assembly	performance.indoor fan representation
RS0004	Air-to-Air Direct Expansion System	performance.dx system representation

Section RS0002.3.2.2, AHRI210240 TestStandardYear: additional enumerator

<u>Enumerator</u>	<u>Description</u>
IP_2008	Rating is based on 2008 AHRI standard ¹
IP_2017	Rating is based on 2017 AHRI standard ²
IP_2023	Rating is based on 2023 AHRI standard ³

Section RS0002.3.3.4, RatingAHRI210240: additional data elements and notes

seer	Seasonal Energy Efficiency Ratio	Numeric	Btu/W·h	>0.0	✓	Represents SEER2 for the 2023 version of test standard.
eer_a_full	Full stage Energy Efficiency Ratio (at 'A' operating conditions)	Numeric	Btu/W·h	>0.0	✓	Represents EER2 _{A,Full} for the 2023 version of test standard.

cooling_g_low_capacity	Low stage net total cooling capacity (at 'G' operating conditions)	Numeric	Btu/h	≥0.0	if staging_type=VARIABLE_STAGE and test_standard_year=IP_2023	
cooling_i_low_capacity	Low stage net total cooling capacity (at 'I' operating conditions)	Numeric	Btu/h	≥0.0	if staging_type=VARIABLE_STAGE and test_standard_year=IP_2023	

cooling_g_low_power	Low stage net total cooling power (at 'G' operating conditions)	Numeric	W	≥0.0	if staging_type=VARIABLE_STAGE and test_standard_year=IP_2023	
cooling_i_low_power	Low stage net total cooling power (at 'I' operating conditions)	Numeric	W	≥0.0	if staging_type=VARIABLE_STAGE and test_standard_year=IP_2023	

<code>rating_reproducible</code> <code>recalculatable_from_performance_data</code>	Whether this rating can be reproduced <u>recalculated</u> using the performance data in the representation	Boolean			✓	True if the rating values in this table can be reproduced <u>recalculated</u> using the performance data in the representation within the tolerance of the rating standard
<code>rating_recalculatable_explanation</code>	<u>An explanation of the value for <code>rating_recalculatable_from_performance_data</code></u>	String				

Section RS0002.3.3.5, RatingAHRI340360: additional data elements and notes

<code>rating_reproducible</code> <code>recalculatable_from_performance_data</code>	Whether this rating can be reproduced <u>recalculated</u> using the performance data in the representation	Boolean			✓	True if the rating values in this table can be reproduced <u>recalculated</u> using the performance data in the representation within the tolerance of the rating standard
<code>rating_recalculatable_explanation</code>	<u>An explanation of the value for <code>rating_recalculatable_from_performance_data</code></u>	String				

Section RS0002.3.3.6, RatingAHRI340360CoolingPartLoadPoint: make data element optional

<code>indoor_fan_power</code>	Power of the indoor fan motor	Numeric	W	>0.0	✗
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Section RS0002.3.3.7, Performance: changes for clarification

Name	Description	Data Type	Units	Constraints	Req	Notes
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standby_power	Continuous unit power draw regardless of fan or DX system operation	Numeric	W	≥0.0	✓	Includes on-board controls and other power not included in the fan or dx system representations
indoor_fan_representation	The corresponding Standard 205 fan assembly representation	{RS0003}				Required if the <u>indoor</u> fan is packaged with the unitary equipment
fan_position	Position of the fan relative to the cooling coil	<FanPosition>			if indoor_fan_representation	
dx_system_representation	The corresponding Standard 205 direct expansion coil system representation	{RS0004}				

Section RS0002.7, References: additional reference

1. AHRI. *ANSI/AHRI 210/240 (2008) with Addenda 1 and 2: Performance Rating of Unitary Air-conditioning & Air-source Heat Pump Equipment*. Arlington, Virginia: AHRI, 2008.
2. AHRI. *ANSI/AHRI 210/240 (2017) with Addendum 1: Performance Rating of Unitary Air-conditioning & Air-source Heat Pump Equipment*. Arlington, Virginia: AHRI, 2017.
3. AHRI. *ANSI/AHRI 210/240-2023 (2020): Performance Rating of Unitary Air-conditioning & Air-source Heat Pump Equipment*. Arlington, Virginia: AHRI, 2020.
4. AHRI. *ANSI/AHRI 340/360 (2007) with Addenda 1 and 2: Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment*. Arlington, Virginia: AHRI, 2007.
5. AHRI. *ANSI/AHRI 340/360 (2015): Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment*. Arlington, Virginia: AHRI, 2015.
6. AHRI. *ANSI/AHRI 340/360 (I-P/2019): Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment*. Arlington, Virginia: AHRI, 2019.

Figure RS0003-1, caption addition for clarity

Figure RS0003–1 Example Fan Assembly for a Packaged System (Does Not Illustrate All Possible Combinations of Components).

Section RS0003.2.3, Embedded Representations: information added for clarity

- RS0005: Motor
- RS0007: Mechanical Drive

Schema Type	Schema Type Description	Data Element
RS0005	Motor	performance.motor_representation
RS0007	Mechanical Drive	performance.mechanical_drive_representation

Section RS0003.3.2.1, OperationSpeedControlType: remove enumeration

RS0003.3.2.1 OperationSpeedControlType.

Enumerator	Description	Notes
DISCRETE	Fan assemblies that operate at one or more defined speeds dictated by a tap or dip switch	Performance map data is provided at individual impeller speeds
CONTINUOUS	Fan assemblies that operate within a continuous range of speeds	Performance map data is provided over a range of impeller speeds

Section RS0003.3.3.4, Performance: change data element to global enumeration

operation_speed_control_type	Type of performance map	{OperationSpeedControlType}			✓	<ul style="list-style-type: none"> Determines which performance map data group is used for performance_map If operation_speed_control_type is DISCRETE performance map data is provided at individual impeller speeds. If operation_speed_control_type is CONTINUOUS, performance map data is provided over a range of impeller speeds.
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Section RS0004, change to section title

RS0004 AIR-TO-AIR DIRECT EXPANSION COIL SYSTEM

Section RS0004.2.1, Applicability: correction for clarification

RS0004.2.1 Applicability. Direct expansion vapor compression refrigerant coil systems with two coils (one evaporator and one condenser) both exchanging heat with air streams to provide cooling.

Figure RS0003-1, caption changes for clarity

Figure RS0004-1 Air-to-Air Direct expansion refrigerant coil system.

Section RS0004.3.3.4, Performance: change to global enumeration

compressor_speed_control_type	Method used to control different speeds of the compressor	<CompressorSpeedControlType>			✓	
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Section RS0005.2.3, Embedded Representations: information added for clarity

- RS0006: Electronic Motor Drive

<u>Schema Type</u>	<u>Schema Type Description</u>	<u>Data Element</u>
<u>RS0006</u>	<u>Electronic Motor Drive</u>	<u>performance.drive_representation</u>