BSR/ASHRAE Addendum *f* to
ANSI/ASHRAE Standard 205-2023

Public Review Draft

Proposed Addendum *f* to Standard 205-2023, Representation of Performance Data for HVAC&R and Other Facility Equipment

First Public Review (January 2026)
(Draft shows Proposed Changes to Current Standard)

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Proposed BSR/ASHRAE/IBPSA Addendum *f* to ANSI/ASHRAE Standard 205-2023, *Representation of Performance Data for HVAC&R and Other Facility Equipment*

(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

Foreword to Addendum *f*

This proposed addendum adds Cycling Order as an attribute for performance map data groups that defines the order that grid variables are cycled in providing the lookup variable values This addition is necessary because lists in JSON (and CBOR) are unordered and the order that grid variables are given may not match the order that they are used to provide the data. The Cycling Order simply specifies the order that was already required in the standard for the order for providing values and does not make any other changes to the standard.

[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and strikethrough (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]

Addendum f to Standard 205-2023

5 DATA MODEL CONTENT

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

Standard 205 data groups shall not be extended except via modification of the standard.

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

5.2 Data Element Attributes. Data elements shall be characterized in data groups using the attributes shown in Table 5–1.

Table 5–1 Data Element Attributes

Attribute	Description	Notes
Name	Public name of data element	See Section 7.3
Description	Text description that defines the meaning of the data element	
Data Type	Data type of data element	See Section 5.3
Units	Units of data 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 data element is mandatory when containing data group is present in a representation	See Section 5.6
Scalable	Indicates whether the data element value is scalable within the limits specified in a Scaling data group	See Section 5.7
Cycling Order	A list of data element names that describe the order grid variable values are cycled for the array of lookup variables in a performance map	See Section 6.3.3.8
Notes	Any supplementary information	

[…]

6.3.3.8 PerformanceMap. Performance maps are required when the performance over the operational range of the equipment cannot be characterized by single data elements. One or more performance maps are included that convey equipment performance for a range of conditions and operating modes. Performance maps shall consist of data elements representing grid variables and lookup variables that relate the performance of the equipment over a range of operating conditions.

Lookup variable values shall be provided in a rectilinear, but not necessarily uniform, grid (as illustrated in Figure 6–1 for three dimensions) defined by the grid variable values. The lookup variable values shall be provided at the vertex defined by the combination of the grid variable values. This implies that both the outer boundary and each cell are hyperrectangles (n-dimensional rectangles).

Grid variable value combinations at which the equipment is in standby operation shall be represented with corresponding lookup variable of type OperationState with a value of STANDBY. Standby operation shall be assumed for

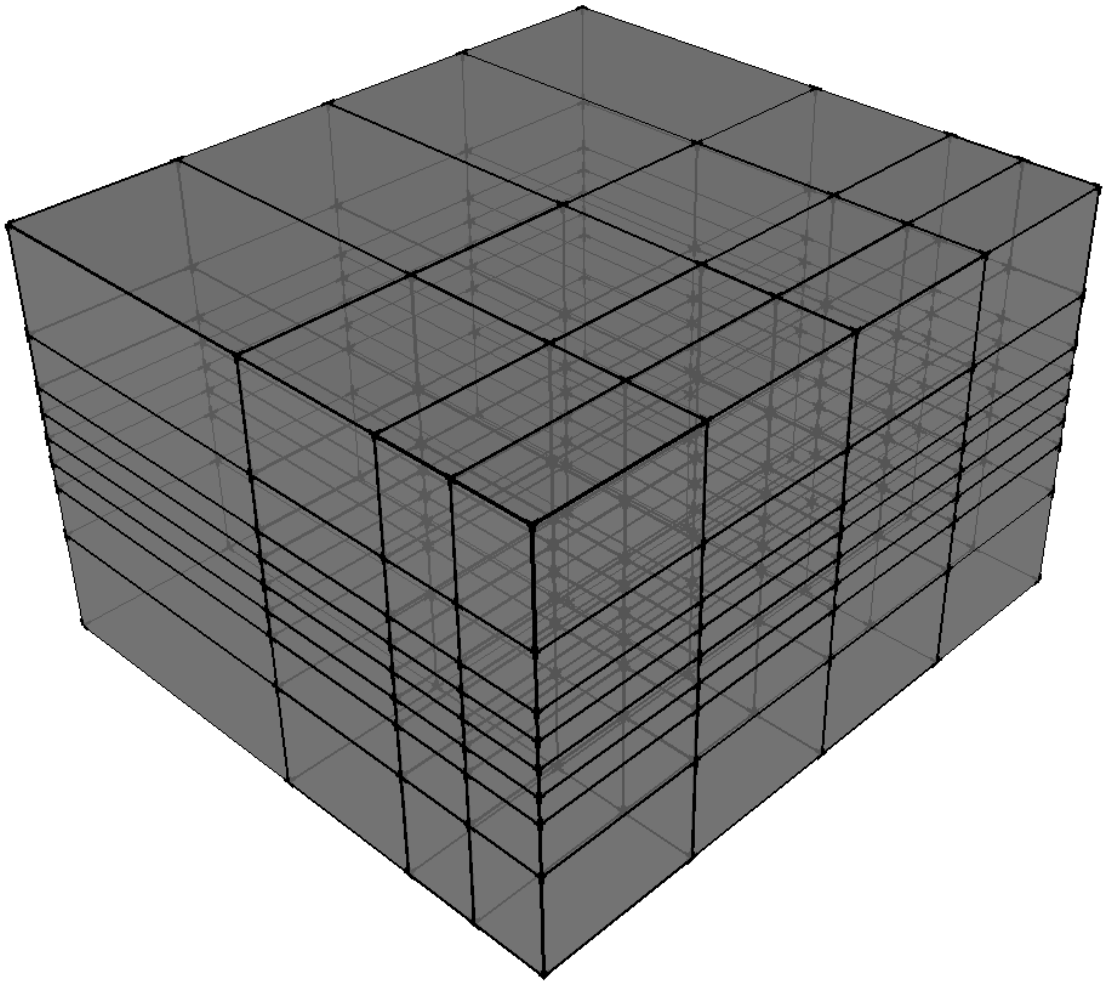

Figure 6–1 Example of a three-dimensional rectilinear grid.

any conditions falling within a grid cell having a lookup variable of type OperationState with a value of STANDBY at any vertex.

Informative note: Application software may create temporary virtual operating points in regions of non-operation as a calculation convenience but shall not infer actual operation in non-operating regions.

Application rules shall define the conditions under which each performance map within a representation shall be used.

Lookup variable values shall be provided with sufficient grid variable spacing to capture non-linear performance characteristics (e.g., inflections).

Informative note: A minimum of two values is required to indicate the operational range of the equipment for each grid variable. A single value for a grid variable indicates that operation is limited to that value (unless otherwise noted for the specific grid variable).

The performance map shall be defined in a data group including two data elements called `grid_variables` and `lookup_variables`. The `lookup_variables` data element definition shall include the "Cycling Order" attribute that lists the order that the grid variables are used in row-major order in providing the lookup variables values. Table 6–16 gives an example for two grid variables ("a" and "b") and a single lookup variable ("V") with a "Cycling Order" of `{a,b}`.

Table 6–16 Row-major order for two grid variables

Grid Variable [a]	Grid Variable [b]	Lookup Variable [V]
a1	b1	$V_{a1,b1}$
a1	b2	$V_{a1,b2}$
a1	b3	$V_{a1,b3}$
a2	b1	$V_{a2,b1}$
a2	b2	$V_{a2,b2}$
a2	b3	$V_{a2,b3}$

6.3.3.9 GridVariables. Each grid variable within the `GridVariable` data group shall be described as an ordered array of values corresponding to points along an axis. Values shall be defined in ascending numerical order.

6.3.3.10 LookupVariables. ~~Lookup variables values~~ Values of the lookup variables 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~~ row-major order of the grid variables listed in the "Cycling Order" attribute of 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`~~ `lookup_variables` data element in the performance map 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 Informative Appendix A for an example.

[…]

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INFORMATIVE APPENDIX A: EXAMPLE PERFORMANCE MAP REPRESENTATION

This example shows the data model for a single performance map and illustrates a representation conforming to this data model. This example does not reflect actual performance data of any specific device and is intended for illustrative purposes only.

Table A-1 Example Performance Map Data Group

Name	Attributes
`grid_variables`	**Description:** Data group defining the grid variables for performance **Data Type:** `{GridVariables}` **Req:** ✓
`lookup_variables`	**Description:** Data group defining the lookup variables performance **Data Type:** `{LookupVariables}` **Cycling Order:** {outdoor_temperature, indoor_temperature, air_volumetric_flow_rate} **Req:** ✓

Table A-2 Example Grid Variable Data Group

Name	Attributes
`outdoor_temperature`	**Description:** ~~Outdoor Temperature~~The temperature of the outdoor air entering the piece of equipment **Data Type:** `[Numeric][1..]` **Units:** K **Constraints:** `≥0.0` **Req:** ✓ **Notes:** For example purposes only
`indoor_temperature`	**Description:** ~~Indoor Temperature~~The temperature of the indoor air entering the piece of equipment **Data Type:** `[Numeric][1..]` **Units:** K **Constraints:** `≥0.0` **Req:** ✓ **Notes:** For example purposes only
`air_volumetric_flow_rate`	**Description:** ~~Air Volumetric Flow Rate~~The volumetric flow rate through the piece of equipment **Data Type:** `[Numeric][1..]` **Units:** m^3/s **Constraints:** `≥0.0` **Req:** ✓ **Notes:** For example purposes only

An example representation of this grid variable data group would be:

```
grid_variables:
  outdoor_temperature: [302.59, 308.15, 313.71]
  indoor_temperature: [295.37, 297.04, 298.71]
  air_volumetric_flow_rate: [0.26, 0.34]
```

Table A-3 Example Lookup Variable Data Group

Name	Attributes
`power`	**Description:** Power **Data Type:** `[Numeric][1..]` **Units:** W **Constraints:** `≥0.0` **Req:** ✓ **Notes:** For example purposes only
`capacity`	**Description:** Capacity **Data Type:** `[Numeric][1..]` **Units:** W **Constraints:** `≥0.0` **Req:** ✓ **Notes:** For example purposes only

An example representation of this lookup variable data group would be:

```
lookup_variables:
  power: [2192.5,2192.5,2192.5,2192.5,2192.5,2192.5,2370,2370,
          2370,2370,2370,2370,2615,2615,2615,2615,2615,2615]
  capacity: [8740,9100,8740,9100,8740,9100,8380,8720,8380,
             8720,8380,8720,8560,8910,8560,8910,8560,8910]
```

An example representation of a performance map data group with the values of the lookup variables expressed explicitly with their corresponding grid variables in table form is shown in Table A-4

Table A-4 Example Performance Map Data Group

outdoor_temperature (K)	indoor_temperature (K)	air_volumetric_flow_rate (m^3/s)	power (W)	capacity (W)
302.59	295.37	0.26	2192.5	8740.0
302.59	295.37	0.34	2192.5	9100.0
302.59	297.04	0.26	2192.5	8740.0
302.59	297.04	0.34	2192.5	9100.0
302.59	298.71	0.26	2192.5	8740.0
302.59	298.71	0.34	2192.5	9100.0
308.15	295.37	0.26	2370.0	8380.0
308.15	295.37	0.34	2370.0	8720.0
308.15	297.04	0.26	2370.0	8380.0
308.15	297.04	0.34	2370.0	8720.0
308.15	298.71	0.26	2370.0	8380.0
308.15	298.71	0.34	2370.0	8720.0
313.71	295.37	0.26	2615.0	8560.0
313.71	295.37	0.34	2615.0	8910.0
313.71	297.04	0.26	2615.0	8560.0
313.71	297.04	0.34	2615.0	8910.0
313.71	298.71	0.26	2615.0	8560.0
313.71	298.71	0.34	2615.0	8910.0

Notice the cycling of the corresponding grid variable values based on the order specified in the "Cycling Order" attribute. In this case, the `air_volumetric_flow_rate` values are cycling on every row, the `indoor_temperature` cycles

every two rows, and the `outdoor_temperature` cycles every six rows. In practice, this defined order allows lookup variables to be conveyed without repetition of grid variable values.

In JSON this example performance map would appear as:

```
{
  "performance_map":{
    "grid_variables":{
      "outdoor_temperature": [302.59, 308.15, 313.71],
      "indoor_temperature": [295.37, 297.04, 298.71],
      "air_volumetric_flow_rate": [0.26, 0.34]
    },
    "lookup_variables":{
      "power": [2192.5,2192.5,2192.5,2192.5,2192.5,2192.5,2370,2370,
                2370,2370,2370,2370,2615,2615,2615,2615,2615,2615],
      "capacity": [8740,9100,8740,9100,8740,9100,8380,8720,8380,
                   8720,8380,8720,8560,8910,8560,8910,8560,8910]
    }
  }
}
```

[…]

Table RS0001–10 PerformanceMapCoolingLiquid

Name	Attributes
`grid_variables`	**Description:** Data group defining the grid variables for cooling performance **Data Type:** `{GridVariablesCoolingLiquid}` **Req:** ✓
`lookup_variables`	**Description:** Data group defining the lookup variables for cooling performance **Data Type:** `{LookupVariablesCoolingLiquid}` **Req:** ✓ **Cycling Order:** {evaporator_liquid_volumetric_flow_rate, evaporator_liquid_leaving_temperature, condenser_liquid_volumetric_flow_rate, condenser_liquid_entering_temperature, compressor_sequence_number}

[…]

Table RS0001–13 PerformanceMapCoolingAir

Name	Attributes
`grid_variables`	**Description:** Data group defining the grid variables for cooling performance **Data Type:** `{GridVariablesCoolingAir}` **Req:** ✓
`lookup_variables`	**Description:** Data group defining the lookup variables for cooling performance **Data Type:** `{LookupVariablesCoolingAir}` **Req:** ✓ **Cycling Order:** {evaporator_liquid_volumetric_flow_rate, evaporator_liquid_leaving_temperature, condenser_air_entering_drybulb_temperature, condenser_air_entering_relative_humidity, ambient_pressure, compressor_sequence_number}

[…]

Table RS0001–16 PerformanceMapCoolingEvaporative

Name	Attributes
`grid_variables`	**Description:** Data group defining the grid variables for cooling performance **Data Type:** `{GridVariablesCoolingEvaporative}` **Req:** ✓
`lookup_variables`	**Description:** Data group defining the lookup variables for cooling performance **Data Type:** `{LookupVariablesCoolingEvaporative}` **Req:** ✓ **Cycling Order:** {evaporator_liquid_volumetric_flow_rate, evaporator_liquid_leaving_temperature, condenser_air_entering_drybulb_temperature, condenser_air_entering_relative_humidity, ambient_pressure, compressor_sequence_number}

[…]

Table RS0001–19 PerformanceMapStandby

Name	Attributes
`grid_variables`	**Description:** Data group defining the grid variables for standby performance **Data Type:** `{GridVariablesStandby}` **Req:** ✓
`lookup_variables`	**Description:** Data group defining the lookup variables for standby performance **Data Type:** `{LookupVariablesStandby}` **Req:** ✓ **Cycling Order:** {environment_dry_bulb_temperature}

[…]

Table RS0001–22 PerformanceMapEvaporatorLiquidPressureDifferential

Name	Attributes
`grid_variables`	**Description:** Data group defining the grid variables for the evaporator liquid pressure differential **Data Type:** `{GridVariablesEvaporatorLiquidPressureDifferential}` **Req:** ✓
`lookup_variables`	**Description:** Data group defining the lookup variables for the evaporator liquid pressure differential **Data Type:** `{LookupVariablesEvaporatorLiquidPressureDifferential}` **Req:** ✓ **Cycling Order:** {evaporator_liquid_volumetric_flow_rate, evaporator_liquid_leaving_temperature}

[…]

Table RS0001–25 PerformanceMapCondenserLiquidPressureDifferential

Name	Attributes
`grid_variables`	**Description:** Data group defining the grid variables for the condenser liquid pressure differential **Data Type:** `{GridVariablesCondenserLiquidPressureDifferential}` **Req:** ✓
`lookup_variables`	**Description:** Data group defining the lookup variables for the condenser liquid pressure differential **Data Type:** `{LookupVariablesCondenserLiquidPressureDifferential}` **Req:** ✓ **Cycling Order:** {condenser_liquid_volumetric_flow_rate, condenser_liquid_entering_temperature}

[…]

Table RS0003–12 PerformanceMapContinuous

Name	Attributes
grid_variables	**Description:** Data group describing grid variables for continuous fan performance **Data Type:** {GridVariablesContinuous} **Req:** ✓
lookup_variables	**Description:** Data group describing lookup variables for continuous fan performance **Data Type:** {LookupVariablesContinuous} **Req:** ✓ **Cycling Order:** {standard_air_volumetric_flow_rate, static_pressure_difference}

[…]

Table RS0003–15 PerformanceMapDiscrete

Name	Attributes
grid_variables	**Description:** Data group describing grid variables for discrete fan performance **Data Type:** {GridVariablesDiscrete} **Req:** ✓
lookup_variables	**Description:** Data group describing lookup variables for discrete fan performance **Data Type:** {LookupVariablesDiscrete} **Req:** ✓ **Cycling Order:** {speed_number, static_pressure_difference}

[…]

Table RS0004–6 PerformanceMapCooling

Name	Attributes
grid_variables	**Description:** Data group defining the grid variables for cooling performance **Data Type:** {GridVariablesCooling} **Req:** ✓
lookup_variables	**Description:** Data group defining the lookup variables for cooling performance **Data Type:** {LookupVariablesCooling} **Req:** ✓ **Cycling Order:** {outdoor_coil_entering_dry_bulb_temperature, indoor_coil_entering_relative_humidity, indoor_coil_entering_dry_bulb_temperature, indoor_coil_air_mass_flow_rate, compressor_sequence_number, ambient_absolute_air_pressure}

[…]

Table RS0004–9 PerformanceMapStandby

Name	Attributes
grid_variables	**Description:** Data group defining the grid variables for standby performance **Data Type:** {GridVariablesStandby} **Req:** ✓
lookup_variables	**Description:** Data group defining the lookup variables for standby performance **Data Type:** {LookupVariablesStandby} **Req:** ✓ **Cycling Order:** {outdoor_coil_environment_dry_bulb_temperature}

[…]

Table RS0005–7 PerformanceMap

Name	Attributes
grid_variables	**Description:** Data group describing grid variables for motor performance **Data Type:** {GridVariables} **Req:** ✓
lookup_variables	**Description:** Data group describing lookup variables for motor performance **Data Type:** {LookupVariables} **Req:** ✓ **Cycling Order:** {shaft_power, shaft_rotational_speed}

[…]

Table RS0006–7 PerformanceMap

Name	Attributes
grid_variables	**Description:** Data group describing grid variables for drive performance **Data Type:** {GridVariables} **Req:** ✓
lookup_variables	**Description:** Data group describing lookup variables for drive performance **Data Type:** {LookupVariables} **Req:** ✓ **Cycling Order:** {output_power, output_frequency}

[…]

Table RS0007–7 PerformanceMap

Name	Attributes
grid_variables	**Description:** Data group describing grid variables for drive performance **Data Type:** {GridVariables} **Req:** ✓
lookup_variables	**Description:** Data group describing lookup variables for drive performance **Data Type:** {LookupVariables} **Req:** ✓ **Cycling Order:** {output_power}