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

Public Review Draft

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

First Public Review (August 2024)
(Draft shows Proposed Changes to Current Standard)

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Proposed BSR/ASHRAE Addendum *d* 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 *d*

Standard 205-2023 Addendum d generalizes the RS0001 representation specification to cover liquid-cooled, air-cooled, and evaporatively-cooled chillers. The representation specification title is changed from "Liquid-Cooled Chiller" to "Chiller" to reflect this broader scope.

[**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 d to Standard 205-2023

Table 5-5 revised as follows:

Table 5–5 SchemaType

Enumerator	Description	Notes
RS0001	~~Liquid-Cooled~~ Chiller	
RS0002	Unitary Cooling Air-Conditioning Equipment	
RS0003	Fan Assembly	
RS0004	Air-to-Air Direct Expansion Refrigerant System	
RS0005	Motor	
RS0006	Electronic Motor Drive	
RS0007	Mechanical Drive	

Table 5-8 revised as follows:

Table 5–8 CondenserType

Enumerator	Description	Notes
AIR	Air-cooled condenser	
LIQUID	Liquid-cooled condenser	
EVAPORATIVE	Evaporative condenser	Evaporative condensers include adiabatically-cooled condensers.

RS0001 revised as follows:

RS0001 ~~LIQUID-COOLED~~ CHILLER

RS0001.1 Identification and History. `schema`: RS0001

`schema_version`	Date	Initial Approved Standard	Notes
1.0.0	2023	2023	Initial publication
2.0.0	2024	2023 - Addenda a, b, & c	
3.0.0	TDB	2023 - Addendum d	Add air-cooled and evaporatively-cooled condensers.

RS0001.2 Scope and Description

RS0001.2.1 Applicability. Electrically driven vapor compression liquid-chilling packages that include one or more hermetic or open drive compressors (centrifugal, screw, scroll, reciprocating, rotary or other types) and are equipped with a liquid-cooled, air-cooled, or evaporatively-cooled condenser.

RS0001.2.2 Exclusions. Steam turbine driven, combustion engine driven, absorption liquid-chilling and liquid-heating packages, nor chillers with a separate heat recovery liquid stream.

RS0001.2.3 Embedded Representations. None.

RS0001.2.4 Referencing Representations. None.

RS0001.2.5 Schematic. Figure RS0001–1 shows a schematic of a liquid-cooled vapor compression refrigeration liquid-chilling package with notes below, Figure RS0001-2 shows a schematic of an air-cooled vapor compression refrigeration liquid-chilling package, and Figure RS0001-3 shows a schematic of an evaporatively-cooled vapor compression refrigeration liquid-chilling package.

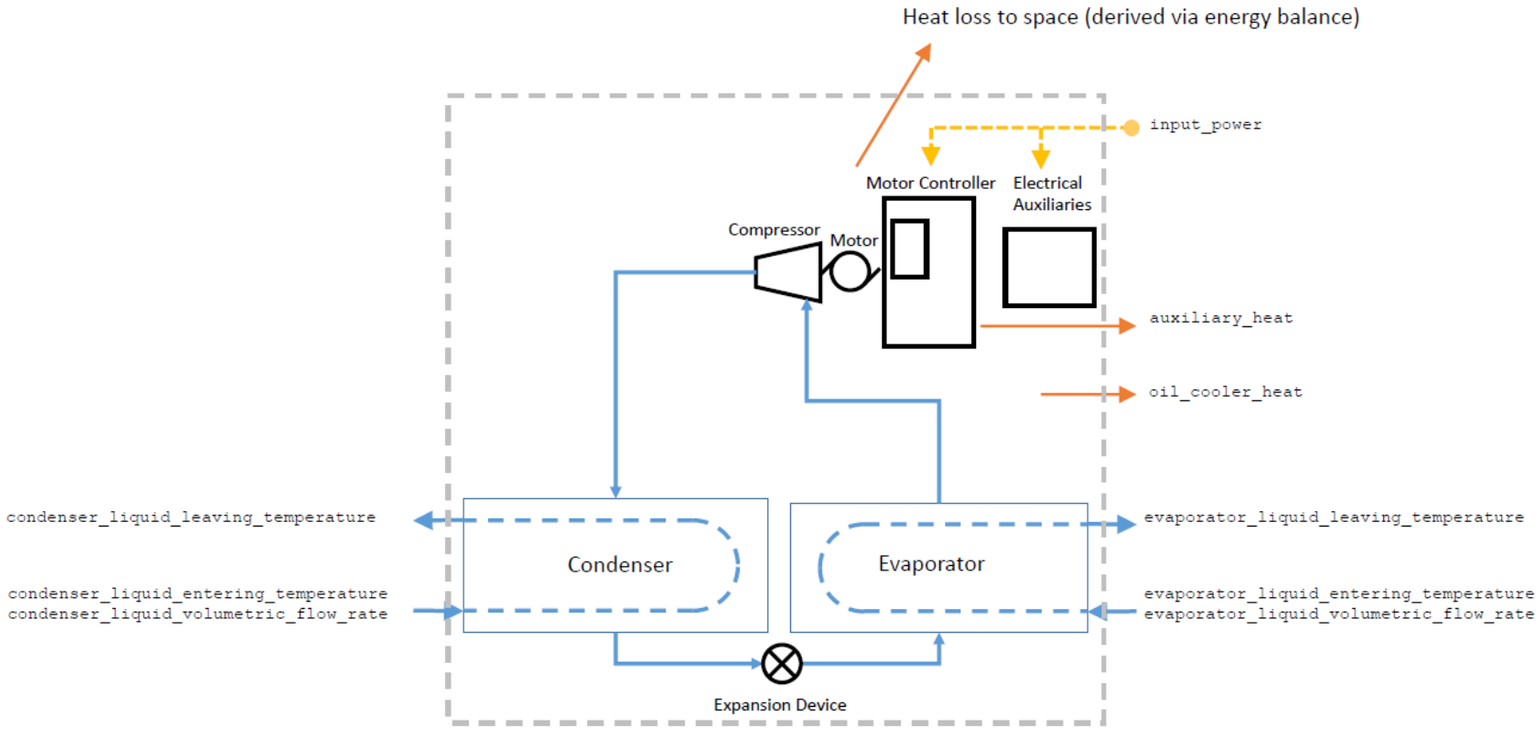

Figure RS0001-1 Liquid-cooled chiller.

- Electrical auxiliaries are components such as control system power, block/compressor/crankcase/oil heaters, purge units, or other devices.
- “Heat loss to space” includes any heat that is dissipated to the air where the chiller is located and is determined by applying the energy balance for the chiller as described in Section RS0001.4.1

- `auxiliary_heat` and `oil_cooler_heat` represent liquid cooled heat exchangers providing auxiliary cooling and/or oil cooling not captured in evaporator or condenser performance values. If the heat loss is captured within the chiller and accounted for in the performance data, then no additional heat flows need to be accounted for. These heat flows are represented as the required heat rejection and not the temperature and flow of the liquid streams providing the cooling.

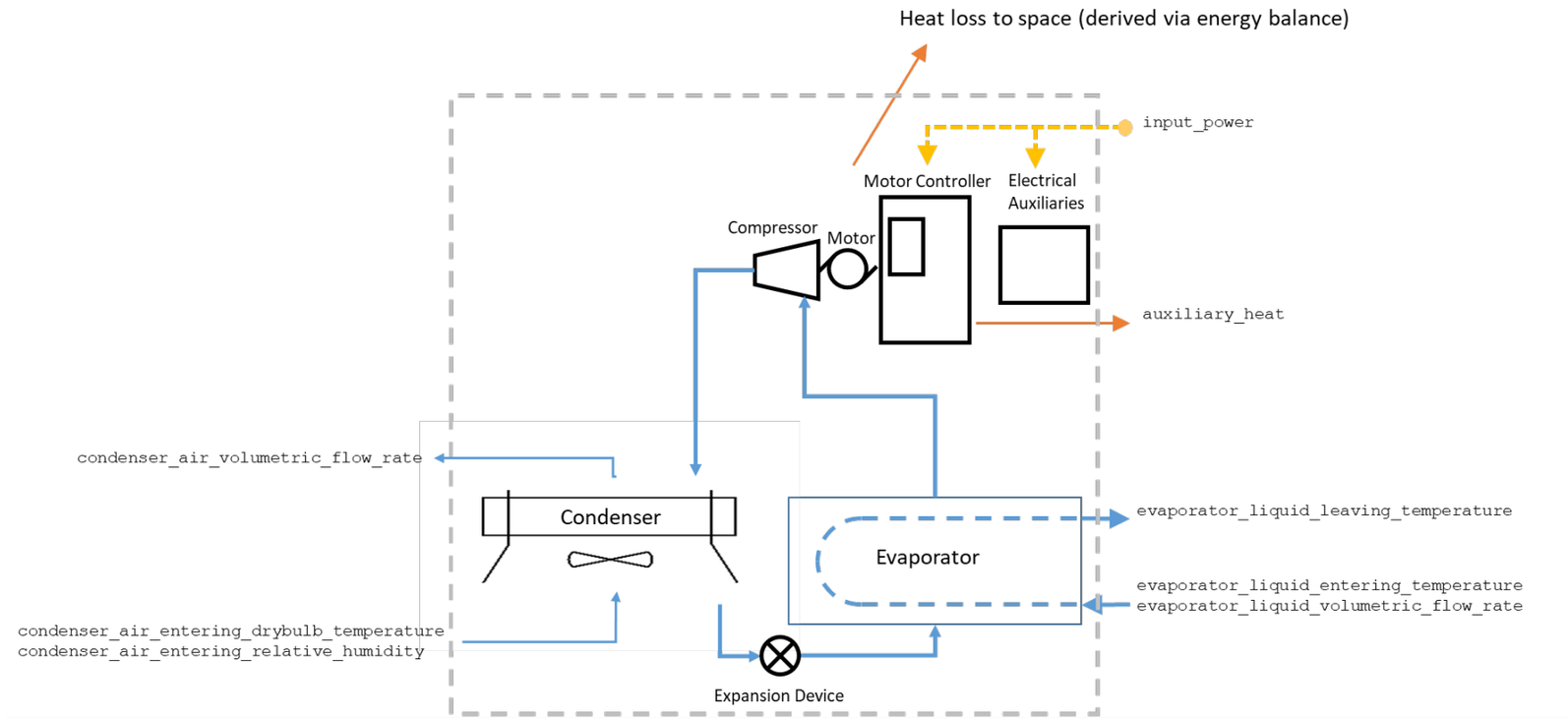

Figure RS0001-2 Air-cooled chiller.

- Electrical auxiliaries are components such as control system power, block/compressor/crankcase/oil heaters, purge units, or other devices.
- "Heat loss to space" includes any heat that is dissipated to the air where the chiller is located and is determined by applying the energy balance for the chiller as described in Section RS0001.4.1

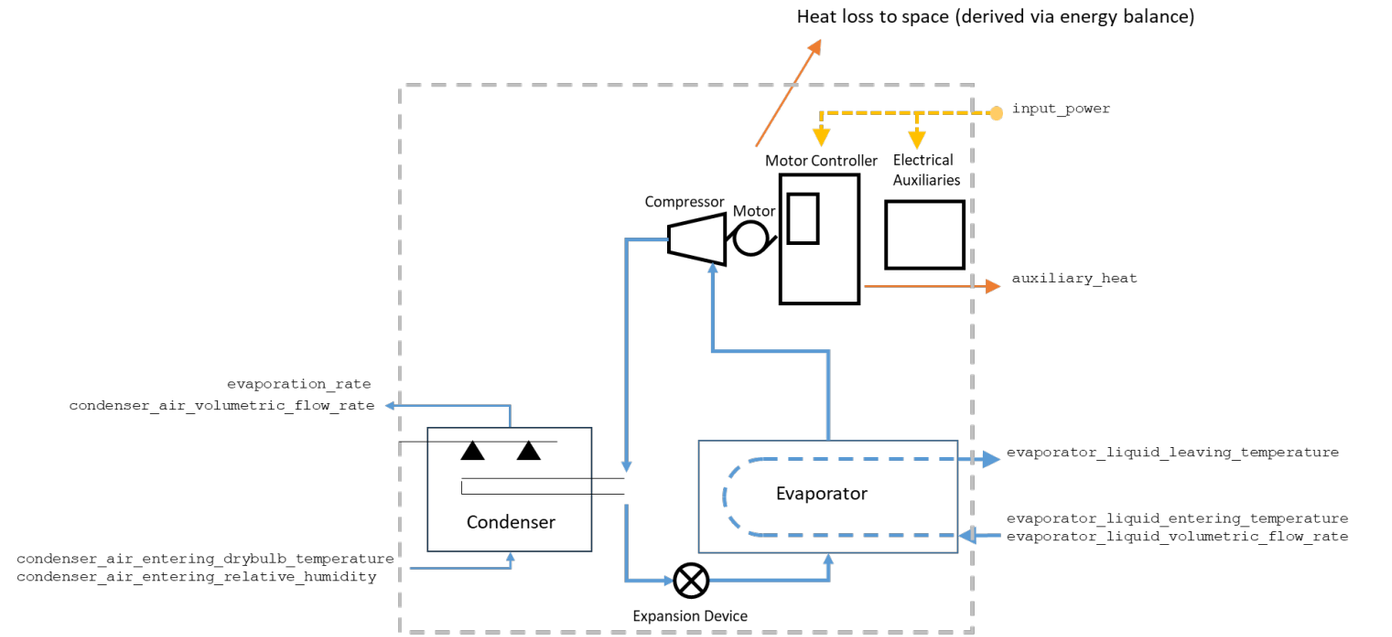

Figure RS0001-3 Evaporatively-cooled chiller.

- Electrical auxiliaries are components such as control system power, block/compressor/crankcase/oil heaters, purge units, or other devices.
- "Heat loss to space" includes any heat that is dissipated to the air where the chiller is located and is determined by applying the energy balance for the chiller as described in Section RS0001.4.1

Table RS0001-9 revised as follows:

Table RS0001–9 Performance

Name	Description	Data Type	Units	Constraints	Req	Scalable	Notes
condenser_type	Heat rejection method for the condenser	<CondenserType>	-		✓		
evaporator_liquid_type	Type of liquid in evaporator	{LiquidMixture}			✓		•LiquidMixture specifies liquid constituents and their concentrations • Density shall be evaluated at the evaporator inlet liquid temperature
condenser_liquid_type	Type of liquid in condenser	{LiquidMixture}			✓if condenser_cooling_type = LIQUID		•LiquidMixture specifies liquid constituents and their concentrations • Density shall be evaluated at the condenser inlet liquid temperature
evaporator_fouling_factor	Factor of heat transfer inhibition due to heat exchanger fouling layer	Numeric	$m^2 \cdot K/W$	≥0.0	✓		• Evaporator fouling factor at which the performance map was created •May be different from the certification data supplied
condenser_fouling_factor	Factor of heat transfer inhibition due to heat exchanger fouling layer	Numeric	$m^2 \cdot K/W$	≥0.0	✓if condenser_cooling_type = LIQUID		•Condenser fouling factor at which the performance map was created •May be different from the certification data supplied
compressor_speed_control_type	Type of compressor speed control	<SpeedControlType>			✓		
cycling_degradation_coefficient	Cycling degradation coefficient (C_D) as described in AHRI 550/590 or AHRI 551/591	Numeric	-	≥0.0, ≤1.0	✓		Used when the unit cycles to meet a setpoint
scaling	Specifies the range the performance	{Scaling}					If not present, scaling of the performance data is not allowed

	data can be scaled to represent different capacity equipment						
performance_map_cooling	Data group describing cooling performance over a range of conditions	{PerformanceMapCooling}			✓		
performance_map_standby	Data group describing standby performance	{PerformanceMapStandby}			✓		
performance_map_evaporator_liquid_pressure_differential	Data group describing the liquid pressure differential through the evaporator	{PerformanceMapEvaporatorLiquidPressureDifferential)			✓		
performance_map_condenser_liquid_pressure_differential	Data group describing the liquid pressure differential through the condenser	{PerformanceMapCondenserLiquidPressureDifferential)			✓if condenser cooling type = LIQUID		

Table RS0001-11 revised as follows:

Table RS0001–11 GridVariablesCooling

Name	Description	Data Type	Units	Constraints	Req	Scalable	Notes
evaporator_liquid_volumetric_flow_rate	Chilled liquid (evaporator) flow	[Numeric][1..]	m^3/s	>0.0	✓	✓	
evaporator_liquid_leaving_temperature	Leaving evaporator liquid temperature	[Numeric][1..]	K	>0.0	✓		
condenser_liquid_volumetric_flow_rate	Condenser liquid flow	[Numeric][1..]	m^3/s	>0.0	✓if condenser cooling type = LIQUID	✓	
condenser_liquid_entering_temperature	Entering condenser liquid temperature	[Numeric][1..]	K	>0.0	✓if condenser cooling type = LIQUID		
condenser_air_entering_drybulb_temperature	Entering condenser air drybulb temperature	[Numeric][1..]	K	>0.0	if condenser cooling type = AIR or condenser cooling type = EVAPORATIVE		

condenser_air_entering_relative_humidity	Entering condenser air relative humidity	[Numeric][1..]	-	≥0.0, ≤1.0	if condenser_cooling_type = AIR or condenser_cooling_type = EVAPORATIVE		
ambient_pressure	Ambient pressure used to calculate the performance	[Numeric][1..]	Pa	>0.0	if condenser_cooling_type = AIR or condenser_cooling_type = EVAPORATIVE		***Informative Note:*** the intent of the ambient pressure is to capture the pressure at the installation and not changes in the ambient pressure due to weather effects
compressor_sequence_number	Index indicating the relative capacity order of the compressor speed/stage expressed in order from lowest capacity (starting at 1) to highest capacity	[Integer][1..]	-	≥1	✓		• If compressor_speed_control_type is DISCRETE, sequence numbers shall be provided for each discrete stage of the compressor(s) • If compressor_speed_control_type is CONTINUOUS, sufficient sequence numbers shall be provided to capture the continuous operation of the compressor(s)

Table RS0001-12 revised as follows:

Table RS0001–12 LookupVariablesCooling

Name	Description	Data Type	Units	Constraints	Req	Scalable	Notes
input_power	Total power input	[Numeric][1..]	W	≥0.0	✓	✓	All power consumed by the chiller, including controls, motors, variable speed drives, purge units, sump heaters, fans, etc.
net_evaporator_capacity	Refrigeration capacity	[Numeric][1..]	W	≥0.0	✓	✓	The available cooling capacity of the evaporator to the thermal load calculated using only the sensible heat transfer
net_condenser_capacity	Condenser heat rejection	[Numeric][1..]	W	≥0.0	✓	✓	The capacity of the condenser transferred to the condenser cooling stream using only the sensible heat transfer
condenser_air_volumetric_flow_rate	Condenser air flow	[Numeric][1..]	m^3/s	>0.0	if condenser_cooling_type = AIR or condenser_cooling_type = EVAPORATIVE	✓	

oil_cooler_heat	Heat transferred to another liquid crossing the control volume boundary from the chiller oil cooler.	[Numeric][1..]	W	≥0.0	~~✓~~if condenser_cooling_type = LIQUID	✓	Set as 0 if not present or if heat rejection is met by condenser
evaporation_rate	Rate at which water evaporates from the condenser	[Numeric][1..]	m^3/s	≥0.0	if condenser_cooling_type = EVAPORATIVE	✓	Does not include blow down or drift losses.
auxiliary_heat	Heat transferred to another liquid crossing the control volume boundary from the chiller auxiliaries (motor, motor controller, inverter drive, starter, etc).	[Numeric][1..]	W	≥0.0	✓	✓	Set as 0 if not present or if heat rejection is met by condenser
operation_state	The operation state at the operating conditions	[<OperationState>]	-		✓		

Section RS0001.6 revised as follows:

RS0001.6 Application Rules

RS0001.6.1 Cooling Performance. `performance_map_cooling` shall be used to simulate performance when system controls call for cooling.
RS0001.6.2 Standby Performance. `performance_map_standby` shall be used to simulate performance under any of the following conditions:

a. system controls are not calling for cooling, or
b. system controls are calling for cooling, but either:

    1. the current simulated conditions are outside the range of grid variables in `performance_map_cooling`, or
    2. the corresponding lookup variable `operation_state` in `performance_map_cooling` has a value of STANDBY at the current simulated conditions.

RS0001.6.3 Fluid Types. The fluid type used in the simulation shall be the same as defined in the representation. A warning shall be provided to the software user if the fluid types do not match.

RS0001.6.4 Evaporative Condenser Water Use. The evaporation rate from the condenser is provided in the performance map. The total water usage of the evaporatively-cooled condenser also includes make-up water flow rate based on the cycles of concentration determined by the water chemistry at the installation and any drift losses from the condenser.