Data Types

Data Type	Description	JSON Schema Type	Examples
`Integer`	A positive or negative whole number (i.e., a number that can be written without a fractional part).	integer	3, 19, -4
`Numeric`	A number that may include a fractional part with optional leading sign and optional exponent (engineering notation).	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
`ID`	A referencencable identification for a data group and sequence of characters of any length using any (specified) character set.	string	AHU-01
`Null`	Indicator that no value is provided. Only used in combination with other data types, e.g., 'Number/Null'.	null	null

ConditioningType

Enumerator	Description	Notes
`HEATED_AND_COOLED`	Heated and cooled	
`HEATED_ONLY`	Heated only	
`SEMIHEATED`	Semiheated	
`UNCONDITIONED`	Unconditioned	

SpaceFunctionType

Enumerator	Description	Notes
`LABORATORY`	Laboratory	
`KITCHEN`	Kitchen	
`OTHER`	Other	

InfiltrationMethodType

Enumerator	Description	Notes
WEATHER_DRIVEN	Weather Driven. The amount of air leakage is determined by using the infiltration_flow_rate with a correlation usually involving windspeed, height, and the difference between indoor and outdoor temperature and is then multiplied by the schedule.	
PRESSURE_BASED	Pressure Based. The amount of air leakage is determined by induced airflows from pressure differences between zones, air distribution system components, the outside due to wind speed and direction.	
CONSTANT	Constant. The schedule is ignored.	
CONSTANT_SCHEDULED	Constant multiplied by the schedule.	
OTHER	Other infiltration methods.	

SurfaceClassificationType

Enumerator	Description	Notes
WALL	Vertical or nearly vertical wall	
FLOOR	Floor	
CEILING	Ceiling	

SurfaceAdjacentTo

Enumerator	Description	Notes
EXTERIOR	Exterior wall or roof which is adjacent to the exterior environment.	
GROUND	Slab-on-grad or below grade surface if adjacent to ground.	
INTERIOR	Interior surface if adjacent to another space which is explicity modeled.	
IDENTICAL	Surface adjacent to a environment identical to the space. Sometimes this is described as adiabatic surface since no heat is transfered. The space on the other side of the surface is not explicity modeled.	
UNDEFINED	The surface adjacency cannot be determined by the software.	

SurfaceConstructionInputOptions

Enumerator	Description	Notes
LAYERS	Construction is entered layer-by-layer.	
SIMPLIFIED	Construction is entered by R-value only.	

SubsurfaceClassificationType

Enumerator	Description	Notes
WINDOW	Window	
SKYLIGHT	Skylight	
DOOR	Door	
OTHER	Other types of subsurfaces that allow light to pass	

SubsurfaceDynamicGlazingType

Enumerator	Description	Notes
NOT_DYNAMIC	Not dynamic	
MANUAL_DYNAMIC	Manual dynamic	
AUTOMATIC_DYNAMIC	Automatic dynamic	

LightingDaylightingControlType

Enumerator	Description	Notes
STEPPED	Stepped	
CONTINUOUS_DIMMING	Continuous Dimming	
OTHER	Other types of daylighting control	
NONE	None	No daylighting is used.

LightingOccupancyControlType

Enumerator	Description	Notes
FULL_AUTO_ON	Full auto on	
PARTIAL_AUTO_ON	Parial auto on	
MANUAL_ON	Manual on	
OTHER	Other types of occupancy control	
NONE	None	No occupancy controls is used.

MiscellaneousEquipmentType

Enumerator	Description	Notes
PLUG	Plug	
PROCESS	Process	
INFORMATION_TECHNOLOGY_EQUIPMENT	Information technology equipment	
OTHER	Other	

TransformerType

Enumerator	Description	Notes
DRY_TYPE	Dry Type	
FLUID_FILLED	Fluid Filled	
OTHER	Other	

ElectricalPhase

Enumerator	Description	Notes
SINGLE_PHASE	Single Phase	
THREE_PHASE	Three Phase	

ScheduleSequenceTypeOptions

Enumerator	Description	Notes
HOURLY	Hourly	
EVENT	Event	

ScheduleTypeOptions

Enumerator	Description	Notes
`MULTIPLIER_DIMENSIONLESS`	Multiplier dimensionless	
`TEMPERATURE`	Temperature	
`POWER`	Power	
`FLOW_RATE`	Flow rate	

DayOfWeek

Enumerator	Description	Notes
`SUNDAY`	Sunday	
`MONDAY`	Monday	
`TUESDAY`	Tuesday	
`WEDNESDAY`	Wednesday	
`THURSDAY`	Thursday	
`FRIDAY`	Friday	
`SATURDAY`	Saturday	

WeatherFileDataSourceTypeOptions

Enumerator	Description	Notes
`HISTORIC_AGGREGATION`	Historic data aggregated to represent typical weather	
`HISTORIC_ACTUAL`	Specific weather data for time period based on monitoring	
`FUTURE`	Weather data projected to represent future conditions	
`OTHER`	Other	

CoolingDesignDayTypeOptions

Enumerator	Description	Notes
`COOLING_0_4`	Cooling design day 0.4% annual cumulative frequency of occurance	
`COOLING_1_0`	Cooling design day 1.0% annual cumulative frequency of occurance	
`COOLING_2_0`	Cooling design day 2.0% annual cumulative frequency of occurance	

HeatingDesignDayTypeOptions

Enumerator	Description	Notes
`HEATING_99_6`	Heating design day 99.6% annual cumulative frequency of occurance	
`HEATING_99_0`	Heating design day 99.0% annual cumulative frequency of occurance	

HeatingSystemType

Enumerator	Description	Notes
`HEAT_PUMP`	Heat Pump	
`FURNACE`	Furnace	
`ELECTRIC_RESISTANCE`	Electric resistance	
`FLUID_LOOP`	Fluid loop	
`BASEBOARD`	Baseboard	
`NONE`	None	
`OTHER`	Other	

HeatpumpAuxilliaryHeatType

Enumerator	Description	Notes
`ELECTRIC_RESISTANCE`	Electric resistance	
`FURNACE`	Furnace	
`NONE`	None	
`OTHER`	Other	

HumidificationType

Enumerator	Description	Notes
`ADIABATIC`	Adiabatic	
`NONE`	None	
`OTHER`	Other	

CoolingSystemType

Enumerator	Description	Notes
`DIRECT_EXPANSION`	Direct expansion	
`FLUID_LOOP`	Fluid loop	
`NON_MECHANICAL`	Non-mechanical	
`NONE`	None	
`OTHER`	Other	

DehumidificationType

Enumerator	Description	Notes
`MECHANCIAL_COOLING`	Mechanical cooling	
`DESICCANT`	Desiccant	
`SERIES_HEAT_RECOVERY`	Series heat recovery	
`NONE`	None	
`OTHER`	Other	

FanSystemTemperatureControlType

Enumerator	Description	Notes
`CONSTANT`	Constant	
`OUTDOOR_AIR_RESET`	Outdoor air reset	
`ZONE_RESET`	Zone reset	
`LOAD_RESET_TO_SPACE_TEMPERATURE`	Load Reset To Space Temperature	
`LOAD_RESET_DIFFERENTIAL_TEMPERATURE`	Load Reset Differential Temperature	
`SCHEDULED`	Scheduled	
`OTHER`	Other	

FanSystemSupplyFanControlType

Enumerator	Description	Notes
CONSTANT	Constant	
VARIABLE_SPEED_DRIVE	Variable speed drive	
MULTISPEED	Multispeed	
INLET_VANE	Inlet vane	
DISCHARGE_DAMPER	Discharge damper	
OTHER	Other	

FanSystemOperationType

Enumerator	Description	Notes
CYCLING	Cycling	
CONTINUOUS	Continuous	
KEEP_OFF	Off	
OTHER	Other	

FanSystemSupplyFanVolumeResetType

Enumerator	Description	Notes
CONSTANT	Constant	
DESIGN_LOAD_RESET	Design Load Reset	
OPERATING_CAPACITY_RESET	Operating Capacity Reset	
OTHER	Other	

AirEconomizerType

Enumerator	Description	Notes
FIXED_FRACTION	Fixed Fraction	
TEMPERATURE	Dry-bulb temperature	
ENTHALPY	Enthalpy	
DIFFERENTIAL_TEMPERATURE	Differential dry-bulb temperature	
DIFFERENTIAL_ENTHALPY	Differential enthalpy	
OTHER	Other	

EnergyRecoveryType

Enumerator	Description	Notes
`SENSIBLE_HEAT_EXHANGE`	Sensible heat exchange	
`ENTHALPY_HEAT_EXHANGE`	Enthalpy heat exchange	
`SENSIBLE_HEAT_WHEEL`	Sensible heat wheel	
`ENTHALPY_HEAT_WHEEL`	Enthalpy heat wheel	
`HEAT_PIPE`	Heat pipe	
`OTHER`	Other	
`NONE`	None	

EnergyRecoveryOperation

Enumerator	Description	Notes
`WHEN_FANS_ON`	When fans on	
`WHEN_MINIMUM_OUTSIDE_AIR`	When minimum outside air	
`SCHEDULED`	Scheduled	
`OTHER`	Other	
`NONE`	None	

EnergyRecoverySupplyAirTemperatureControl

Enumerator	Description	Notes
`FIXED_SETPOINT`	Fixed setpoint	
`MIXED_AIR_RESET`	Mixed air reset	
`OTHER`	Other	
`NONE`	None	

DemandControlVentilationControlType

Enumerator	Description	Notes
`CO2_RETURN_AIR`	CO2 return air	
`CO2_ZONE`	CO2 zone	
`OTHER`	Other	
`NONE`	None	

FanSpecificationMethodOptions

Enumerator	Description	Notes
`SIMPLE`	Simple	Specify the electric power input of fan
`DETAILED`	Detailed	Specify the brake horse power, design pressure rise through, total efficiency, motor efficiency

TerminalType

Enumerator	Description	Notes
`VARIABLE_AIR_VOLUME`	Variable air volume	
`CONSTANT_AIR_VOLUME`	Constant air volume	
`RADIANT`	Radiant	
`FOUR_PIPE_FAN_COIL_UNIT`	Four pipe fan coil unit	
`TWO_PIPE_FAN_COIL_UNIT`	Two pipe fan coil unit	
`BASEBOARD`	Baseboard	
`OTHER`	Other	

TerminalFanConfiguration

Enumerator	Description	Notes
`PARALLEL`	Parallel	
`SERIES`	Series	
`OTHER`	Other	

HeatingSourceType

Enumerator	Description	Notes
`ELECTRIC`	Electric	
`HOT_WATER`	Hot water	
`NONE`	None	
`OTHER`	Other	

CoolingSourceType

Enumerator	Description	Notes
`CHILLED_WATER`	Chilled water	
`NONE`	None	
`OTHER`	Other	

FluidLoopFlowControlOptions

Enumerator	Description	Notes
`FIXED_FLOW`	Fixed flow	
`VARIABLE_FLOW`	Variable flow	

FluidLoopTypeOptions

Enumerator	Description	Notes
`HEATING`	Heating	
`COOLING`	Cooling	
`HEATING_AND_COOLING`	Heating and cooling	
`CONDENSER`	Condenser	
`OTHER`	Other	

TemperatureResetTypeOptions

Enumerator	Description	Notes
NO_RESET	No Reset	
CONSTANT	Constant	
OUTSIDE_AIR_RESET	Outside air reset	
LOAD_RESET	Load Reset	
OTHER	Other	

FluidLoopOperationOptions

Enumerator	Description	Notes
CONTINUOUS	Continuous	
INTERMITTENT	Intermittent/on-demand	
SCHEDULED	Scheduled	

PumpSpeedControlOptions

Enumerator	Description	Notes
FIXED_SPEED	Fixed speed	
VARIABLE_SPEED	Variable speed	

PumpSpecificationMethodOptions

Enumerator	Description	Notes
SIMPLE	Simple	Specify the electric power input of pump
DETAILED	Detailed	Specify the motor nameplate power, design head, impellor efficiency, motor efficiency

BoilerCombustionOptions

Enumerator	Description	Notes
NATURAL	Natural	
FORCED	Forced	

BoilerEfficiencyMetricTypeOptions

Enumerator	Description	Notes
`ANNUAL_FUEL_UTILIZATION`	Annual fuel utilization efficiency	
`THERMAL`	Thermal efficiency	
`COMBUSTION`	Combustion efficiency	

ChillerPartLoadEfficiencyMetricTypeOptions

Enumerator	Description	Notes
`INTEGRATED_PART_LOAD_VALUE`	Integrated part load value efficiency expressed as a coefficient of performance (COP)	
`NONSTANDARD_PART_LOAD_VALUE`	Nonstandard part load value efficiency expressed as a coefficient of performance (COP)	
`OTHER`	Other part load efficiency metric	

ChillerCompressorTypeOptions

Enumerator	Description	Notes
`SCREW`	Screw	
`CENTRIFUGAL`	Centrifugal	
`RECIPROCATING`	Reciprocating	
`SCROLL`	Scroll	
`POSITIVE_DISPLACEMENT`	Positive displacement	
`SINGLE_EFFECT_INDIRECT_FIRED_ABSORPTION`	Single-effect indirect-fired absorption	
`DOUBLE_EFFECT_INDIRECT_FIRED_ABSORPTION`	Double-effect indirect-fired absorption	
`SINGLE_EFFECT_DIRECT_FIRED_ABSORPTION`	Single-effect direct-fired absorption	
`DOUBLE_EFFECT_DIRECT_FIRED_ABSORPTION`	Double-effect direct-fired absorption	
`OTHER`	Other	

HeatRejectionTypeOptions

Enumerator	Description	Notes
OPEN_CIRCUIT_COOLING_TOWER	Open-circuit cooling tower	
CLOSED_CIRCUIT_COOLING_TOWER	Closed-circuit cooling tower or fluid cooler	
DRY_COOLER	Dry-cooler or air-cooled fluid cooler	
EVAPORATIVE_CONDENSER	Evaporative condenser	
AIR_COOLED_CONDENSER	Air cooled condenser	
OTHER	Other	

HeatRejectionFanTypeOptions

Enumerator	Description	Notes
AXIAL	Axial or Propellor	
CENTRIFUGAL	Centrifugal	
OTHER	Other	

HeatRejectionFluidOptions

Enumerator	Description	Notes
WATER	Water	
REFRIGERANT	Refrigerant	Including R-448A
AMMONIA	Ammonia	
OTHER	Other	

HeatRejectionFanSpeedControlOptions

Enumerator	Description	Notes
CONSTANT	Constant	
TWO_SPEED	Two Speed	
VARIABLE_SPEED	Variable Speed	
OTHER	Other	

ExternalFluidSourceTypeOptions

Enumerator	Description	Notes
`CHILLED_WATER`	Chilled water	
`HOT_WATER`	Hot water	
`STEAM`	Steam	

ServiceWaterHeatingConfigurationType

Enumerator	Description	Notes
`HERS_PARALLEL_PIPING`	HERS parallel piping	
`HERS_PIPE_INSULATION_ALL_LINES`	HERS pipe insulation of all lines	
`HERS_RECIRCULATION_DEMAND_CONTROL_OCCUPANCY_SENSOR`	HERS recirculation demand control occupancy sensor	
`HERS_RECIRCULATION_DEMAND_CONTROL_BUTTON`	HERS recirculation demand control pull botton	
`HERS_RECIRCULATION_NON_DEMAND_CONTROL`	HERS recirculation non-demand control	
`INSULATED_AND_PROTECTED_PIPE_BELOW_GRADE`	Insulated and protected pipe below grade	
`PARALLEL_PIPING`	Parallel piping	
`PIPE_INSULATION_ALL_LINES`	Pipe insulation of all lines	
`POINT_OF_USE`	Point of use	
`RECIRCULATION_DEMAND_CONTROL_OCCUPANCY_SENSOR`	Recirculation demand control occupancy sensor	
`RECIRCULATION_DEMAND_CONTROL_BUTTON`	Recirculation demand control pull botton	
`RECIRCULATION_NON_DEMAND_CONTROL`	Recirculation non-demand control	
`STANDARD`	Standard	
`OTHER`	Other	

ServiceWaterHeatingHeatRecoveryType

Enumerator	Description	Notes
NOT_APPLICABLE	Not applicable	
VERTICAL	Vertical	
HORIZONTAL	Horizontal	
OTHER	Other	

ServiceWaterHeaterType

Enumerator	Description	Notes
CONVENTIONAL	Conventional	
HEAT_PUMP_PACKAGED	Heat pump packaged	
HEAT_PUMP_SPLIT	Heat pump split	
HEAT_FROM_HOT_WATER_LOOP	Heat from hot water loop	Should also specifiy hot water loop when this is used
COMBINATION_SERVICE_AND_SPACE	Combination space and service water heater.	Should also specifiy hot water loop when this is used
OTHER	Other	

ComponentLocation

Enumerator	Description	Notes
IN_ZONE	In a zone	
CONDITIONED	Conditioned	
SEMICONDITIONED	Semiconditioned	
OUTSIDE	Outside	
GARAGE	Garage	
ATTIC	Attic	
CRAWL_SPACE	Crawl space	
UNDERGROUND	Underground	
UNCONDITIONED	Unconditioned	
OTHER	Other	

ServiceWaterHeaterTankType

Enumerator	Description	Notes
`CONSUMER_INSTANTANEOUS`	Consumer instantaneous	Uses UEF
`COMMERCIAL_INSTANTANEOUS`	Commercial instantaneous	Uses TE
`CONSUMER_STORAGE`	Consumer storage	Uses UEF
`COMMERCIAL_STORAGE`	Consumer storage	Uses TE and SBL
`RESIDENTIAL_DUTY_COMMERCIAL_INSTANTANEOUS`	Residential-Duty Commercial Instantaneous	Uses UEF
`INDIRECT`	Indirect	
`BOILER`	Boiler	
`COMMERCIAL_PACKAGED_BOILER`	Commercial Packaged Boiler	
`OTHER`	Other	

ServiceWaterHeatingFixtureType

Enumerator	Description	Notes
`SHOWER`	Shower	
`BATH`	Bath	
`RESTROOM_SINK`	Restroom Sink	
`DISHWASHER`	Dishwasher	
`KITCHEN_SINK`	Kitchen sink	
`WASH_SINK`	Wash sink	
`CLOTHES_WASHER`	Clothes washing machine	
`OTHER`	Other	

ServiceWaterHeatingUseUnits

Enumerator	Description	Notes
POWER_PER_PERSON	Power per person	
POWER_PER_AREA	Power per area	
POWER	Power	
VOLUME_PER_PERSON	Volume per person	
VOLUME_PER_AREA	Volume per area	
VOLUME	Volume	
OTHER	Other	

EnergySourceTypeOptions

Enumerator	Description	Notes
ELECTRICITY	Electricity	
NATURAL_GAS	Natural gas	
PROPANE	Propane	
FUEL_OIL	Fuel oil	
NONE	None	No energy consumption by a utility supplied source occurs
OTHER	Other	

RefrigerationType

Enumerator	Description	Notes
`COMMERCIAL_REFRIGERATION`	Commercial refrigeration	
`COMMERCIAL_REFRIGERATOR_SOLID_DOOR`	Commercial refrigerator solid door	
`COMMERCIAL_REFRIGERATOR_TRANSPARENT_DOOR`	Commercial refrigerator transparent door	
`COMMERCIAL_FREEZER_SOLID_DOOR`	Commercial freezer solid door	
`COMMERCIAL_FREEZER_TRANSPARENT_DOOR`	Commercial freezer transparent door	
`COMMERCIAL_PULLDOWN_REFRIGERATOR`	Commercial pulldown refrigerator	
`COMMERCIAL_REFRIGERATOR_FREEZER_SOLID_DOOR`	Commercial refrigerator freezer solid door	
`OTHER`	Other	

RefrigerationCategory

Enumerator	Description	Notes
`HORIZONTAL_OPEN`	Horizontal open	
`HORIZONTAL_SOLID_DOOR`	Horizontal solid door	
`HORIZONTAL_TRANSPARENT_DOOR`	Horizontal transparent door	
`SEMIVERTICAL_OPEN`	Semivertical open	
`SERVICE_OVER_COUNTER`	Service over counter	
`VERTICAL_OPEN`	Vertical open	
`VERTICAL_SOLID_DOOR`	Vertical solid door	
`VERTICAL_TRANSPARENT_DOOR`	Vertical transparent door	
`OTHER`	Other	

ApplicationTemperatureType

Enumerator	Description	Notes
`MEDIUM`	Medium temperature	3.3 C +/- 1.1 C (38 F +/- 2 F)
`LOW`	Low temperature	-17.8 C +/- 1.1 C (0 F +/- 2 F)
`ICE_CREAM`	Ice cream	-26.1 C +/- 1.1 C (-15 F +/- 2 F)
`OTHER`	Other	

ASHRAE229

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group.	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`ruleset_model_instances`	References an instance of a ruleset model with a unique ruleset_model_type.	`[{RulesetModelInstance}]`				For rulesets with ruleset model instances (i.e., user, proposed, baseline,..) generated as separate files, only one instance would be defined for each ASHRAE229 RMR json file. For rulesets where the software always produces all ruleset model instances together, multiple ruleset model instances would appear in the same ASHRAE229 RMR json file. References between data groups are restricted to be within the same ruleset model instance.
`calendar`	Information on the calendar used with the simulation.	`{Calendar}`				
`weather`	Information on the local weather conditions used with the simulation.	`{Weather}`				
`compliance_path`	Indicates the chosen compliance path if the ruleset has multiple compliance paths such as 90.1 Appendix G has code compliance and beyond code	`<CompliancePathType2019ASHRAE901>`				
`output_format_type`	Format used for output	`(<OutputSchema2019ASHRAE901>, <OutputSchema2019T24>, OutputSchemaRESNET)`				

RulesetModelInstance

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`ruleset_model_type`	Describes the current model instance for rulesets with multiple simulation models	`(<RulesetModelType2019ASHRAE901>, <RulesetModelTypeRESNET, <RulesetModelType2019T24Com>, <RulesetModelType2019T24Res>)`				
`transformers`	Electrical transformers at the building site	`[{Transformer}]`				Contains a list of transformers that convert electricity from a higher voltage to one used by the building, exterior lighting, and other services at the site.
`buildings`	Buildings on the site	`[{Building}]`				Contains a list of buildings on the site (often just one).
`schedules`	Schedules for internal loads, thermostats, equipment operation and control, and any other need.	`[{Schedule}]`				Contains a list of schedules used in model.
`measured_infiltration_pressure_difference`	Differential pressure difference used during measurement for infiltration values.	`Numeric`	Pa	≥0		Used as rating conditions for air leakage for a building. The most common values used are 50 Pa or 75 Pa since they correspond to common rating conditions.
`is_measured_infiltration_based_on_test`	Indicates whether the differential pressure difference used during measurement for infiltration values is based on pressure testing of the building.	`Boolean`				
`building_rotation_angles`	A list of angles that building simulations are performed and results are provided.	`[Numeric]`	degrees			List of angles that the building has been rotated.
`fluid_loops`	Fluid loops on the site	`[{FluidLoop}]`				Contains a list of fluid loops on the site.
`service_water_heating_distribution_systems`	Service water heating systems on the site	`[{ServiceWaterHeatingDistributionSystem}]`				Contains a list of service water heating distribution systems at the site.
`service_water_heating_equipment`	Service water heating equipment on the site	`[{ServiceWaterHeatingEquipment}]`				Contains a list of service water heating equipment at the site.
`pumps`	Pumps used on the site	`[{Pump}]`				

Name	Description	Data Type	Units	Range	Req	Notes
boilers	Boilers used on the site	[{Boiler}]				
chillers	Chillers used on the site	[{Chiller}]				
heat_rejections	HeatRejections used on the site	[{HeatRejection}]				
external_fluid_source	ExternalFluidSources used on the site	[{ExternalFluidSource}]				
site_zone_type	Site zone type for Sec 9.4.2	<ExteriorLightingZones2019ASHRAE901>				

Building

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
building_segments	Large portions of a building that share a building area type	[{BuildingSegment}]				Contains a list of building segments in the building.
elevators	Elevators	[{Elevator}]				Contains a list of elevators in the building.
exterior_lighting	Exterior lighting systems	[{ExteriorLighting}]				Contains a list of exterior lighting systems for the building.
refrigeration_components	Refrigeration	[{Refrigeration}]				Contains a list of refrigeration components in the building.
building_open_schedule	Reference to the schedule containing indicating when the building is open	$ID			✓	One represent when the building is open and zero when closed. Constraint to use when implemented :Schedule:
has_site_shading	Indicates whether the site has features that cast shadows on the building	Boolean				

BuildingSegment

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
number_of_floors_above_grade	Number of floors above grade	Numeric		≥0		JG to verify if used in test case description.
number_of_floors_below_grade	Number of floors below grade	Numeric		≥0		JG to verify if used in test case description.
is_all_new	Indicates whether the building segment is completely new construction (true) or existing (false).	Boolean				Projects that include additions should have a building segments that are existing (false) and for the addition (true). Curtain rules such as baseline fenestration area will apply differently to each portion.
zones	Zones in the building	[{Zone}]				Contains a list of zones in the building.
heating_ventilation_air_conditioning_systems	HVAC systems in the building	[{HeatingVentilationAirConditioningSystem}]				Contains a list of HVAC systems in the building.
area_type_vertical_fenestration	Building area classification used for vertical fenestration	<VerticalFenestrationBuildingAreaType2019ASHRAE901>				The enumeration is based on the standard used.
lighting_building_area_type	Building area lighting area type	<LightingSpaceType2019ASHRAE901T951TG38>				
area_type_heating_ventilation_air_conditioning_system	Classification used for HVAC	<HeatingVentilationAirConditioningBuildingAreaType2019ASHRAE901>				The enumeration is based on the standard used. JG to verify if used in test case description.

Zone

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	No multipliers or floor multipliers are used with the Zone data group so each zone should be individually identified.
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`spaces`	Spaces in the zone	`[{Space}]`				Contains a list of spaces in the building.
`floor_name`	Floor name	`String`				Used to group zones on a floor. Zones with the same floor name are on the same floor. Numbers may be used as part of the floor name such as Level 1. If a number is used it should increase for increasing heights and use negative values for stories generally below ground. The floor name should generally correspond to numbering of floors on the plans. JG to verify if used in test case description.
`volume`	Volume of the space	`Numeric`	m3	≥0		
`surfaces`	Surfaces surrounding the zone	`[{Surface}]`				Contains a list of surfaces that define the zone.
`conditioning_type`	Space conditioning category	`<ConditioningType>`				
`infiltration`	Airleakage into the zone.	`{Infiltration}`				References a single infiltration data group.
`design_thermostat_cooling_setpoint`	Setpoint temperature for cooling during occupied hours	`Numeric`	C			JG to verify if used in test case description.
`thermostat_cooling_setpoint_schedule`	Reference to the schedule containing the cooling setpoint temperatures	`$ID`			✓	Constraint to use when implemented :Schedule:
`design_thermostat_heating_setpoint`	Setpoint temperature for heating during occupied hours	`Numeric`	C			JG to verify if used in test case description.
`thermostat_heating_setpoint_schedule`	Reference to the schedule containing the heating setpoint temperatures	`$ID`			✓	Constraint to use when implemented :Schedule:
`terminals`	List of terminals	`[{Terminal}]`				Multiple terminals may be used such as from a VAV system, a DOAS, and a baseboard. JG to verify if used in test case description.
`served_by_service_water_heating_system`	A service water heating system serving the zone	`$ID`				Contains a single ID of the service water heating system serving the zone - from Unique Identification Number in ServiceWaterHeatingSystem. Constraint to use when implemented :ServiceWaterHeatingDistributionSystem:
`transfer_airflow_rate`	Airflow rate for transfer air	`Numeric`	L/s			Net transfer air. Positive values indicate transfer air in to the zone and negative values show transfer out of the zone. JG to verify if used in test case description.
`exhaust_airflow_rate`	Airflow rate for exhaust air	`Numeric`	L/s	≥0		JG to verify if used in test case description.
`makeup_airflow_rate`	Airflow rate for makeup air	`Numeric`	L/s	≥0		JG to verify if used in test case description.

Name	Description	Data Type	Units	Range	Req	Notes
`non_mechanical_cooling_fan_power`	Non-mechanical cooling fan power	`Numeric`	W	≥0		JG to verify if used in test case description.
`non_mechanical_cooling_fan_airflow`	Non-mechanical cooling fan airflow	`Numeric`	L/s	≥0		JG to verify if used in test case description.
`air_distribution_effectiveness`	Air distribution effectiveness	`Numeric`		≥0		JG to verify if used in test case description.

Space

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`interior_lighting`	Internal lighting that produce internal gains for a space.	`[{InteriorLighting}]`				
`miscellaneous_equipment`	Miscellaneous equipment loads that produce internal gains for a space.	`[{MiscellaneousEquipment}]`				
`floor_area`	The floor area of the space.	`Numeric`	m2	≥0		The floor area of a space within the building, including basements, mezzanine and intermediate-floored tiers, and penthouses with a headroom height of 7.5 ft or greater. It is measured from the exterior faces of walls or from the center-line of walls separating buildings, but excluding covered walkways, open roofed-over areas, porches and similar spaces, pipe trenches, exterior terraces or steps, chimneys, roof overhangs, and similar features. This is the floor area that is modeled.
`number_of_occupants`	Number of occupants in the space	`Numeric`		≥0		
`occupant_multiplier_schedule`	Reference to the schedule containing the multiplier for the number of occupants	`$ID`			✓	Constraint to use when implemented :Schedule:
`occupant_sensible_heat_gain`	Sensible heat gain of each occupant.	`Numeric`	W	≥0		JG to verify if used in test case description.
`status_type`	Choice of new, existing, addition, alteration, etc. for each ruleset.	`(<SpaceStatusType2019ASHRAE901>, <GeneralStatusType2019T24>)`				
`space_function`	Generic function for the space.	`<SpaceFunctionType>`				The enumeration is based on the standard used.
`lighting_space_type`	Lighting space type classification	`<LightingSpaceType2019ASHRAE901TG37>`				The enumeration is based on the standard used.
`ventilations_space_type`	Ventilation space type classification	`<VentilationSpaceType2019ASHRAE901>`				The enumeration is based on the standard used.

Name	Description	Data Type	Units	Range	Req	Notes
`service_water_heating_space_type`	Service water heating space type classification	`<ServiceWaterHeatingSpaceType2019ASHRAE901>`				The enumeration is based on the standard used.
`service_water_heating_uses`	List of service water heating uses	`[{ServiceWaterHeatingUse}]`				

Infiltration

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`modeling_method`	The software methodology chosen for modeling infiltration	`<InfiltrationMethodType>`				
`algorithm_name`	Name of the algorithm used for modeling infiltration in the specific simulation engine.	`String`				
`measured_air_leakage_rate`	Meaured air leakage rate from infiltration of outside air	`Numeric`	m3/s	≥0		Based on the pressure described in ASHRAE229.measured_infiltration_pressure_difference.
`infiltration_flow_rate`	Design infiltration flow rate	`Numeric`	m3/s	≥0		Infiltration flow rate for simulation infiltration models unadjusted for temperature difference or windspeed or schedule often with a windspeed at 10 mph (4.5 m/s). This may vary in meaning between simulation engines.
`multiplier_schedule`	Referenced to the schedule containing the multiplier for the infiltration	`$ID`				Constraint to use when implemented :Schedule:

Surface

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`subsurfaces`	Suburfaces that are on the surface	`[{Subsurface}]`				Contains a list of surfaces that define the space.
`classification`	Classification for the surface.	`<SurfaceClassificationType>`				Options for surface being interior or exterior wall, floor, or ceiling.
`area`	area of the surface	`Numeric`	m2	≥0		Measured from interior face area. It is the gross area of the wall and includes the area of all subsurfaces.
`tilt`	Angle between vertical and the surface outward normal	`Numeric`	degrees			Example value would be 0 = roof, 90 = wall, 180 = downward facing surface (exterior floor)
`azimuth`	Clockwise angle between North and the horizontal projection of the wall's outward normal.	`Numeric`	degrees	≥0		Example values would be 0 = north, 90 = East, 180 = South, 270 = West
`adjacent_to`	Used to classify the conditions on the surface.	`(<SurfaceAdjacentTo>, <AdditionalSurfaceAdjacentToRESNET>, <AdditionalSurfaceAdjacentTo2019ASHRAE901>)`				Determines whether the other side of the surface is modeled and if not what assumptions should be used.
`adjacent_zone`	ID of the adjacent zone for interior surface. Only required when adjacent zone is explicity modeled when adjacent_to is set to INTERIOR.	`$ID`				Constraint to use when implemented :Zone:
`does_cast_shade`	Determines whether the surface is modeled as casting shade on other exterior surfaces	`Boolean`				
`construction`	Construction description of surface.	`{Construction}`				
`surface_optical_properties`	Optical properties of the surface.	`{SurfaceOpticalProperties}`				
`status_type`	Choice of new, existing, addition, alteration, etc. for each ruleset.	`<GeneralStatusType2019T24>`				

Construction

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
surface_construction_input_option	Identifies whether construction is entered layer-by-layer or simplified (R-value)	<SurfaceConstructionInputOptions>				
fraction_framing	Fraction of the construction that is framing.	Numeric		≥0,≤1		Fraction of the construction using framing_layers, the remaining portion uses the primary_layers. If blank, assume zero framing.
primary_layers	List of names of layer descriptions starting from the outside surface for primary heat path	[{Material}]				For constructions with framing and cavity heat transfer paths, use this for the cavity. For constructions with homogeneous layer, use this element only. Air films should not be included in the list of layers.
framing_layers	List of names of layer descriptions starting from the outside surface for the framing heat path	[{Material}]				For constructions with framing and cavity heat transfer paths, use this for the framing otherwise leave blank. Air films should not be included in the list of layers.
insulation_location	The location of the insulation related to the surface	String				
u_factor	suface U-factor	Numeric	W/m2-K	≥0		Includes interior and exterior air films as specified by the referenced standard.
c_factor	surface C-factor	Numeric	W/m2-K	≥0		
f_factor	surface F-factor	Numeric	W/m-K	≥0		
r_value	r-value of the insulation for the surface	Numeric	K-m2/W	≥0		
has_radiant_heating	Includes embedded radiant heating elements	Boolean				
has_radiant_cooling	Includes embedded radiant cooling elements	Boolean				

Material

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
thickness	The thickness of the material layer	Numeric	m	>0		
thermal_conductivity	The thermal conductivity of the material layer	Numeric	W/m-K	≥0		When thermal_conductivity is specified, r_value should not be provided.
density	The density of the material layer	Numeric	kg/m3	≥0		
specific_heat	The specific heat of the material layer	Numeric	J/kg-K	≥0		
r_value	r-value of the insulation for the material layer	Numeric	K-m2/W	≥0		When r_value is specified, thermal_conductivity should not be provided. Typically used for insulation or air gaps.

SurfaceOpticalProperties

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`absorptance_thermal_exterior`	Thermal absorptance of long wavelength radiation on the exterior surface.	`Numeric`		≥0		May also be called thermal emittance, emittance or emissivity and represents the fraction of incident long wavelength radiation that is absorbed by the material
`absorptance_solar_exterior`	Thermal absorptance of short wavelength radiation on the exterior surface.	`Numeric`		≥0		Equals one minus the solar reflectance (for opaque materials) and represents the fraction of incident solar radiation that is absorbed by the material

Name	Description	Data Type	Units	Range	Req	Notes
`absorptance_visible_exterior`	Thermal absorptance of visible radiation on the exterior surface.	`Numeric`		≥0		Equals one minus the visible reflectance (for opaque materials) and represents the fraction of incident visible wavelength radiation that is absorbed by the material
`absorptance_thermal_interior`	Thermal absorptance of long wavelength radiation on the interior surface.	`Numeric`		≥0		May also be called thermal emittance, emittance or emissivity and represents the fraction of incident long wavelength radiation that is absorbed by the material
`absorptance_solar_interior`	Thermal absorptance of short wavelength radiation on the interior surface.	`Numeric`		≥0		Equals one minus the solar reflectance (for opaque materials) and represents the fraction of incident solar radiation that is absorbed by the material

Name	Description	Data Type	Units	Range	Req	Notes
`absorptance_visible_interior`	Thermal absorptance of visible radiation on the interior surface.	`Numeric`		≥0		Equals one minus the visible reflectance (for opaque materials) and represents the fraction of incident visible wavelength radiation that is absorbed by the material

Subsurface

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`classification`	Classification for the subsurface being window, skylight, door.	`<SubsurfaceClassificationType>`				
`subclassification`	Standard specific subclassification for subsurfaces	`<SubsurfaceSubclassificationType2019ASHRAE901>`				
`is_operable`	Identifies whether window subsurface can be opened and closed including by pivoting or sliding.	`Boolean`				This applies to windows and skylights but not to doors.
`has_open_sensor`	Has sensor and reports to building control system when the window or door is open.	`Boolean`				
`framing_type`	The material of the framing.	`<SubsurfaceFrameType2019ASHRAE901>`				This applies to windows and skylights but not to doors.
`glazed_area`	Area of subsurface including glass and transparent surfaces	`Numeric`	m2	≥0		
`opaque_area`	Area of subsurface framing for a window or skylight or opaque portion for a door.	`Numeric`	m2	≥0		
`u_factor`	Overall Subsurface U-factor	`Numeric`	W/m2-K	≥0		Includes interior and exterior air films as specified by the referenced standard.
`dynamic_glazing_type`	Type of dynamic glazing for the window subsurface	`<SubsurfaceDynamicGlazingType>`				Indicates if the glazed subsurface can change it's performance properties and if it is automatic or not.
`solar_heat_gain_coefficient`	Subsurface SHGC	`Numeric`		≥0		For dynamic glazing represents the minimum SHGC
`maximum_solar_heat_gain_coefficient`	Maximum Subsurface SHGC for Dynamic Glazing	`Numeric`		≥0		Only used for dynamic glazing
`visible_transmittance`	Subsurface VT	`Numeric`		≥0		For dynamic glazing represents the maximum visible transmittance
`minimum_visible_transmittance`	Minimum Subsurface VT for Dynamic Glazing	`Numeric`		≥0		Only used for dynamic glazing

Name	Description	Data Type	Units	Range	Req	Notes
depth_of_overhang	Distance from the edge of the overhang to the subsurface.	Numeric	m	≥0		
has_shading_overhang	Identifies whether subsurface has overhangs	Boolean				
has_shading_sidefins	Identifies whether subsurface has sidefins	Boolean				
has_manual_interior_shades	Are there manually-operated interior shading such as blinds, curtains or shades	Boolean				
solar_transmittance_multiplier_summer	Solar transmittance multiplier for summer	Numeric		≥0		Often used to account for interior shading such as drapes.
solar_transmittance_multiplier_winter	Solar transmittance multiplier for summer	Numeric		≥0		Often used to account for interior shading such as drapes.
has_automatic_shades	Are there automatic interior shading such as blinds, curtains or shades	Boolean				
status_type	Choice of new, existing, addition, alteration, etc. for each ruleset.	<GeneralStatusType2019T24>				

InteriorLighting

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`purpose_type`	Lighting purpose type classification	`<LightingPurposeType2019ASHRAE901>`				The enumeration is based on the standard used.
`power_per_area`	Total power for lights divided by the area of the space.	`Numeric`	W/m2			When computing the power per area use the area of the entire space.
`lighting_multiplier_schedule`	Reference to the schedule containing the multiplier for lighting	`$ID`			✓	Constraint to use when implemented :Schedule:
`occupancy_control_type`	Indicates the type of occupancy controls	`<LightingOccupancyControlType>`				
`daylighting_control_type`	Indicates the type of daylighting controls	`<LightingDaylightingControlType>`				
`are_schedules_used_for_modeling_occupancy_control`	Indicates that schedule values are used for modeling the impacts of occupancy controls on lighting.	`Boolean`				
`are_schedules_used_for_modeling_daylighting_control`	Indicates that schedule values are used for modeling the impacts of daylighting controls on lighting.	`Boolean`				For simulations that are modeling daylighting by computing the illumance this should be false.

MiscellaneousEquipment

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
energy_type	Source of energy for the miscellaneous equipment in the space	<EnergySourceTypeOptions>				To indicate that the energy is not accounted for by any utility supplied source, choose NONE
energy_per_time	The energy per unit time for miscellaneous equipment in the space	Numeric	W			The value of energy per unit time for the miscellaneous equipment in the space that when multiplied by the schedule is the consumption of power (for electricity or other energy_type's) for each period in the schedule.
multiplier_schedule	Reference to the schedule containing the multiplier for miscellaneous equipment power in the space.	$ID			✓	Constraint to use when implemented :Schedule:
sensible_fraction	Fraction of energy that is a sensible load on the space.	Numeric		≥0, ≤1		Sensible plus latent do not necessarily add up to 1.0.
latent_fraction	Fraction of energy that is a latent load on the space.	Numeric		≥0, ≤1		Sensible plus latent do not necessarily add up to 1.0.
miscellaneous_equipment_type	Type of miscellaneous equipment	<MiscellaneousEquipmentType>				
has_automatic_control	Indicates that the receptacles have automatic controls	Boolean				

Transformer

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`type`	The type of transformer	`<TransformerType>`				
`phase`	The number of electrical phases	`<ElectricalPhase>`				
`efficiency`	Transformer efficiency	`Numeric`		≥0, ≤1		Expresses the efficiency of the transformer as a fraction from 0 to 1, where 1 would represent 100% efficiency.
`capacity`	Rated Capacity of the Transformer	`Numeric`	V-A	≥0		
`peak_load`	Annual Peak electric load on the transformer	`Numeric`	W	≥0		Peak electric load on the transfomer based on an annual simulation with typical weather file.

Schedule

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`purpose`	The purpose of schedule	`String`				Describe the purpose of the schedule and how it can be used. Not an enumerations. The purpose assigned by BEM tool should match across RMRs. Examples include thermostat, multiplier for lighting, availability for equipment.
`schedule_sequence_type`	Schedule sequence type	`<ScheduleSequenceTypeOptions>`				
`hourly_values`	Hourly Values of Schedule	`[Numeric][0..8760]`				Used when schedule_sequence_type is HOURLY. Can also use functions like EFLH(), MAX(), MIN() to determine overall characteristics for the list of schedule values.
`event_times`	Event times when the schedule changes	`[Numeric]`	s			Used when schedule_sequence_type is EVENT to describe the time of the year in seconds that the schedule changes value.
`event_values`	Event value at corresponding event time.	`[Numeric]`				Used when schedule_sequence_type is EVENT. New values starting at corresponding to the event time until following event time minus one second. Can also use functions like EFLH(), MAX(), MIN() to determine overall characteristics for the list of schedule values.
`type`	The type of schedule	`<ScheduleTypeOptions>`				Primarily indicates if the values may be represented by units such as C for temperature or W for power or m3/s for flow rate or are dimensionless multipliers.
`prescribed_schedule`	True if any schedule values have changed from what appears in the schedule library	`<PrescribedSchedules2019ASHRAE901>`				
`is_schedule_modified_for_workaround`	True if any schedule has been modified for a workaround	`Boolean`				

Calendar

Name	Description	Data Type	Units	Range	Req	Notes
notes	Supplementary information to provide context to the model reviewer	String				
day_of_week_for_january_1	Day of the week for January 1	<DayOfWeek>				
is_leap_year	The schedules assume it is a leap year	Boolean				
has_daylight_saving_time	The schedules adjust for Daylight Saving Time	Boolean				

Weather

Name	Description	Data Type	Units	Range	Req	Notes
notes	Supplementary information to provide context to the model reviewer	String				
ground_temperature_schedule	Ground temperature schedule name	$ID				Constraint to use when implemented :Schedule:
weather_file_name	The file name for the weather file including extension.	String				The file name for the annual weather file such as from TMY, TRY, CWEC, CTZ, WYEC or other sources.
data_source_type	Data source use for the weather file.	<weatherFileDataSourceTypeOptions>			✓	
climate_zone	The designation of the climate zone where the building is located	<ClimateZone2019ASHRAE901>			✓	The enumeration is based on the standard used.
cooling_design_day_type	The frequency of occurance type for cooling design day	<CoolingDesignDayTypeOptions>				
heating_design_day_type	The frequency of occurance type for heating design day	<HeatingDesignDayTypeOptions>				

Elevator

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`motor_location_zone`	Zone where the heat from the motor goes	`$ID`				When specified, it is the zone the heat from the elevator motor get added to
`motor_heat_fraction`	Fraction of heat from the motor that is added as a sensible load zone.	`Numeric`		≥0, ≤1		
`cab_location_zone`	Zone where the heat from the cab goes	`$ID`				When specified, it is the zone the heat from the cab get added to to the zone including lighting heat, fan heat, and accessory heat
`cab_heat_fraction`	Fraction of heat from the cab that is added as a sensible load zone.	`Numeric`		≥0, ≤1		When specified, it is the fraction of the heat from the cab that gets added to the zone including lighting heat, fan heat, and accessory heat
`is_variable_speed_motor`	If the elevator uses a variable speed motor drive	`Boolean`				JG to verify if used in test case description.
`motor_power`	Elevator average hourly peak motor power	`Numeric`	W			The motor power can be provided either together with or, instead of, the detailed elements used to calculate it.
`cab_counterweight`	Elevator car counterweight	`Numeric`	kg			

Name	Description	Data Type	Units	Range	Req	Notes
`cab_weight`	Weight of elevator car	`Numeric`	kg			
`design_elevator_load`	Elevator load at which to operate	`Numeric`	kg			
`speed`	Design speed of the elevator	`Numeric`	m/s			
`cab_area`	Floor area of elevator cab	`Numeric`	m2			
`cab_lighting_power`	Lighitng power of cab	`Numeric`	W			
`cab_ventilation_fan_power`	Ventilation fan power of cab	`Numeric`	W			
`cab_ventilation_fan_flow`	Airflow of cab ventfan	`Numeric`	L/s			
`cab_motor_multiplier_schedule`	Elevator motor operation multiplier schedule name	`$ID`				Constraint to use when implemented :Schedule:
`cab_ventilation_fan_multiplier_schedule`	Elevator ventilation fan operation mulitplier schedule name	`$ID`				Constraint to use when implemented :Schedule:
`cab_lighting_multiplier_schedule`	Elevator lighting multiplier schedule name	`$ID`				Constraint to use when implemented :Schedule:

HeatingVentilationAirConditioningSystem

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`fan_system`	Fan system	`{FanSystem}`				One FanSystem for each HeatingVentilationAirConditioningSystem so if a direct outdoor air system is used a second Zone Terminal should be specified with a separate HeatingVentilationAirConditioningSystem. JG to verify if used in test case description.
`heating_system`	Heating system	`{HeatingSystem}`				JG to verify if used in test case description.
`cooling_system`	Cooling system	`{CoolingSystem}`				JG to verify if used in test case description.
`preheat_system`	Pre-heating system	`{HeatingSystem}`				JG to verify if used in test case description.
`status_type`	Choice of new, existing, addition, alteration, etc. for each ruleset.	`<GeneralStatusType2019T24>`				

HeatingSystem

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`heating_system_type`	Heating system type	`<HeatingSystemType>`				JG to verify if used in test case description.
`energy_source_type`	Source of energy for the chiller	`<EnergySourceTypeOptions>`				
`hot_water_loop`	Referenced to the hot water fluid loop	`$ID`				Constraint to use when implemented :FluidLoop:
`heat_capacity`	Heating capacity	`Numeric`	W	≥0		The design heat capacity.
`oversizing_factor`	The oversizing factor applied to the peak load that results in the heat capacity. Zero indicates no oversizing.	`Numeric`		≥0		Used for furnace or heat pump. JG to verify if used in test case description.
`is_autosized`	True if the component is automatically sized by the simulation software	`Boolean`				JG to verify if used in test case description.
`heating_coil_setpoint`	Setpoint of the air leaving the heating coil	`Numeric`	C			JG to verify if used in test case description.
`full_load_efficiency`	Full Low Efficiency expressed as a coefficient of performance or thermal efficiency	`Numeric`	W/W			Used for furnace or heat pump. JG to verify if used in test case description.
`part_load_efficiency`	Efficiency value based on the selected part_load_efficiency_metric	`Numeric`		≥0, ≤1		Used for furnace or heat pump. JG to verify if used in test case description.
`heatpump_auxilliary_heat_type`	Heatpump auxilliary heat type used for backup	`<HeatpumpAuxilliaryHeatType>`				JG to verify if used in test case description.
`heatpump_auxilliary_heat_high_temperature_shutoff`	Heatpump auxilliary heat high temperature shutoff	`Numeric`	C			JG to verify if used in test case description.
`heatpump_low_temperature_shutoff`	Heatpump low temperature shutoff	`Numeric`	C			JG to verify if used in test case description.
`humidification_type`	Humidification type	`<HumidificationType>`				JG to verify if used in test case description.

CoolingSystem

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
cooling_system_type	Cooling system type	<CoolingSystemType>				JG to verify if used in test case description.
total_cool_capacity	Total cooling capacity	Numeric	W	≥0		Designed total cooling capacity. JG to verify if used in test case description.
sensible_cool_capacity	Sensible cooling capacity	Numeric	W	≥0		Designed sensible cooling capacity
oversizing_factor	The oversizing factor applied to the peak load that results in the heat capacity. Zero indicates no oversizing.	Numeric		≥0		JG to verify if used in test case description.
is_autosized	True if the component is automatically sized by the simulation software	Boolean				JG to verify if used in test case description.
chilled_water_loop	Referenced to the Chilled water fluid loop	$ID				Constraint to use when implemented :FluidLoop:
condenser_water_loop	Referenced to the Condenser water fluid loop	$ID				Constraint to use when implemented :FluidLoop:
full_load_efficiency	Full Low Efficiency expressed as a coefficient of performance (COP)	Numeric	W/W			Used for direct expansion. JG to verify if used in test case description.
part_load_efficiency	Efficiency value based on the selected part_load_efficiency_metric	Numeric		≥0, ≤1		Used for direct expansion. JG to verify if used in test case description.
dehumidification_type	Dehumidification type	<DehumidificationType>				JG to verify if used in test case description.
cooling_turndown_ratio	Cooling turndown ratio	Numeric				Cooling capacity turndown before simultanenous heating and cooling occurs. JG to verify if used in test case description.

FanSystem

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
supply_fans	List of supply fans	[{Fan}]				JG to verify if used in test case description.
return_fans	List of return fans	[{Fan}]				JG to verify if used in test case description.
exhaust_fans	List of exhaust fans	[{Fan}]				JG to verify if used in test case description.
relief_fans	List of relief fans	[{Fan}]				JG to verify if used in test case description.
air_economizer	Air side economizer related to the fan system	{AirEconomizer}				
air_energy_recovery	Air side energy recovery related to the fan system	{AirEnergyRecovery}				
is_variable_air_volume	If the fan system is variable air volume.	Boolean				JG to verify if used in test case description.
temperature_control	Supply air temperature control type	<FanSystemTemperatureControlType>				JG to verify if used in test case description.
operation_during_occupied	Operation during occupied times type	<FanSystemOperationType>				JG to verify if used in test case description.
operation_during_unoccupied	Operation during unoccupied times type	<FanSystemOperationType>				JG to verify if used in test case description.
fan_control	Supply fan control type	<FanSystemSupplyFanControlType>				JG to verify if used in test case description.
supply_air_temperature_setpoint	Supply air temperature setpoint temperarue	Numeric	C			JG to verify if used in test case description.
reset_differential_temperature	Supply air temperature reset differential temperature at minimum cooling load	Numeric	K			When temperature_control is LOAD_RESET_TO_SPACE_TEMPERATURE this temperate is added to the supply air temperature at minimum cooling load conditions. When temperature_control is LOAD_RESET_DIFFERENTIAL_TEMPERATURE this temperate is the temperate below space tempature when no cooling load. JG to verify if used in test case description.
supply_air_temperature_reset_load_fraction	Supply air temperature reset load fraction	Numeric				When temperature_control is a reset option this is the threshold fraction to use below which supply air temperature reset begins and ramps down to zero. JG to verify if used in test case description.
supply_air_temperature_reset_schedule	Supply air temperature reset schedule	$ID				JG to verify if used in test case description. Constraint to use when implemented :Schedule:
fan_volume_reset_type	Fan volume reset control type	<FanSystemSupplyFanVolumeResetType>				JG to verify if used in test case description.
fan_volume_reset_fraction	Fan volume reset load fraction	Numeric				When fan_volume_reset_type is DESIGN_LOAD_RESET this is the fraction of the design load that corresponds to minimum air flow. When fan_volume_reset_type is OPERATING_CAPACITY_RESET this is the fraction of the instantenous operating capacity that corresponds to minimum air flow. JG to verify if used in test case description.
operating_schedule	Operating schedule name	$ID				Zero when fan is off. JG to verify if used in test case description. Constraint to use when implemented :Schedule:
exhaust_schedule	Exhaust fan schedule name	$ID				Zero when fan is off. JG to verify if used in test case description. Constraint to use when implemented :Schedule:
minimum_airflow	Minimum volume airflow	Numeric	L/s			JG to verify if used in test case description.
minimum_outdoor_airflow	Minimum outdoor air volume airflow	Numeric	L/s			JG to verify if used in test case description.
maximum_outdoor_airflow	Maximum outdoor air volume airflow	Numeric	L/s			JG to verify if used in test case description.
air_filter_merv_rating	The MERV rating of the air filter	Numeric		≥1, ≤20		JG to verify if used in test case description.
has_fully_ducted_return	If the fan system has fully ducted return.	Boolean				JG to verify if used in test case description.
demand_control_ventilation_control	Demand control ventilation control type	<DemandControlVentilationControlType>				JG to verify if used in test case description.

AirEconomizer

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`type`	Type	`<AirEconomizerType>`				JG to verify if used in test case description.
`high_limit_temperature_shutoff`	High limit temperature shutoff	`Numeric`	C			JG to verify if used in test case description.

AirEnergyRecovery

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`energy_recovery_type`	Energy recovery type	`<EnergyRecoveryType>`				JG to verify if used in test case description.
`enthalpy_recovery_ratio`	Enthalpy recovery ratio	`Numeric`				JG to verify if used in test case description.
`energy_recovery_operation`	Energy recovery operation	`<EnergyRecoveryOperation>`				JG to verify if used in test case description.
`energy_recovery_supply_air_temperature_control`	Energy recovery supply air temperature control	`<EnergyRecoverySupplyAirTemperatureControl>`				JG to verify if used in test case description.
`design_sensible_effectiveness`	Design sensible effectiveness	`Numeric`				JG to verify if used in test case description.
`design_latent_effectiveness`	Design sensible effectiveness	`Numeric`				JG to verify if used in test case description.

Fan

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`design_airflow`	Design airflow	`Numeric`	L/s			JG to verify if used in test case description.
`specification_method`	Options for how the fan is specified	`<FanSpecificationMethodOptions>`				
`design_electric_power`	Design electric fan power	`Numeric`	W			Only used when specification_method is set to Simple. JG to verify if used in test case description.
`design_pressure_rise`	Pressure rise through fan at design flow conditions	`Numeric`	m			Only used when specification_method is set to Detailed
`nameplate_power`	nameplate power of fan	`Numeric`	W			Only used when specification_method is set to Detailed. JG to verify if used in test case description.
`input_power`	input power of fan	`Numeric`	W			Power delivered to the fanÂ's shaft and does not include the mechanical drive losses. Equivalent to fan brake horsepower for inch-pound units. Only used when specification_method is set to Detailed. JG to verify if used in test case description.
`total_efficiency`	Total fan efficiency	`Numeric`		≥0, ≤1		Only used when specification_method is set to Detailed.
`motor_efficiency`	Fan motor efficiency	`Numeric`		≥0, ≤1		Only used when specification_method is set to Detailed.
`motor_heat_to_airflow_fraction`	Fraction of motor heat added to the airflow.	`Numeric`		≥0, ≤1		Fraction to airflow plus fraction to zone do not necessarily add up to 1.0.
`motor_heat_to_zone_fraction`	Fraction of motor heat added to the zone.	`Numeric`		≥0, ≤1		Fraction to airflow plus fraction to zone do not necessarily add up to 1.0.
`motor_location_zone`	Zone where the heat from the motor goes	`$ID`				When specified, it is the zone the heat from the fan motor get added to
`status_type`	Choice of new, existing, addition, alteration, etc. for each ruleset.	`<GeneralStatusType2019T24>`				
`output_validation_points`	Energy validation points	`[{FanOutputValidationPoint}]`				Airflow is input to each validation point and energy output is the result. A minimum number of four points is recommended.

FanOutputValidationPoint

Name	Description	Data Type	Units	Range	Req	Notes
`airflow`	Load	`Numeric`	L/s			No name and id is needed since typically used as one of a series.
`result`	Result	`Numeric`	W			

Terminal

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`type`	Type of terminal	`<TerminalType>`				JG to verify if used in test case description.
`served_by_heating_ventilation_air_conditioning_system`	HVAC system serving the terminal	`$ID`				Contains ID of the HVAC system serving the terminal - from Unique Identification Number in HeatingVentilationAirConditioningSystem. Constraint to use when implemented :HeatingVentilationAirConditioningSystem:
`heating_source`	Source of heating	`<HeatingSourceType>`				Used for terminal heating including reheat. JG to verify if used in test case description.
`heating_from_loop`	References the fluid loop used to provide heating	`$ID`				Only used when heating_source is hot water. Used for terminal heating including reheat. Constraint to use when implemented :FluidLoop:
`cooling_source`	Source of cooling	`<CoolingSourceType>`				Used for terminal cooling. JG to verify if used in test case description.
`cooling_from_loop`	Referenced the fluid loop used to provide cooling	`$ID`				Only used when cooling_source is chilled water. Used for terminal cooling including radiant and fan coils. Constraint to use when implemented :FluidLoop:
`fan`	Terminal fan	`{Fan}`				JG to verify if used in test case description.
`fan_configuration`	Fan configuration	`<TerminalFanConfiguration>`				JG to verify if used in test case description.
`primary_airflow`	Zone terminal primary airflow	`Numeric`	L/s			JG to verify if used in test case description.
`secondary_airflow`	Zone terminal secondary_airflow	`Numeric`	L/s			JG to verify if used in test case description.
`supply_temperature_setpoint`	Zone terminal supply temperature setpoint	`Numeric`	C			JG to verify if used in test case description.
`minimum_airflow`	Zone terminal minimum volume airflow	`Numeric`	L/s			JG to verify if used in test case description.
`minimum_outdoor_airflow`	Zone terminal minimum outdoor air volume airflow	`Numeric`	L/s			JG to verify if used in test case description.
`minimum_outdoor_airflow_multiplier_schedule`	Zone terminal minimum outdoor air volume airflow multiplier schedule name	`$ID`				JG to verify if used in test case description. Constraint to use when implemented :Schedule:
`heating_capacity`	Heating capacity for baseboard or radiant system or reheat	`Numeric`	W			Only includes the heating capacity of the terminal for hot water or electric coil. JG to verify if used in test case description.
`cooling_capacity`	Cooling capacity for the radiant system or cooling coil	`Numeric`	W			Only includes the cooling capacity of the terminal for chilled water coil for radiant or fan coil. JG to verify if used in test case description.
`is_supply_ducted`	True if the the supply is ducted.	`Boolean`				
`has_demand_control_ventilation`	True if the zone has demand control ventilation	`Boolean`				The zone is either served by an air handler that responds to demand control ventilation signals from that zone or is served by a DOAS that specifically provides air to that zone on demand. JG to verify if used in test case description.

FluidLoop

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
type	Type of loop	<FluidLoopTypeOptions>				
pump_power_per_flow_rate	Total design pump power divided by the loop design flow rate	Numeric	W/s-L			This is the pump power per flow rate for the entire pumping system on the current FluidLoop. The power and flow rate should be for the current FluidLoop only and does not include power and flow rate in any child loops.
child_loops	Other fluid loops connected to this one as children.	[{FluidLoop}]				Secondary loops should be described as child loops.
cooling_or_condensing_design_and_control		{FluidLoopDesignAndControl}				
heating_design_and_control		{FluidLoopDesignAndControl}				

FluidLoopDesignAndControl

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`design_supply_temperature`	Design Supply Temperature	`Numeric`	C			
`design_return_temperature`	Design Return Temperature	`Numeric`	C			
`is_sized_using_coincident_load`	True if the loop is sized based on coincident load	`Boolean`				
`minimum_flow_fraction`	Minimum fraction of full flow allowed	`Numeric`				
`operation`	Type of operation used by loop	`<FluidLoopOperationOptions>`				
`operation_schedule`	Operation schedule	`$ID`				One represents when the fluid loop is availble to be operating and zero when not available to be operating. Only used when operation equals SCHEDULED. Constraint to use when implemented :Schedule:
`flow_control`	Flow control options	`<FluidLoopFlowControlOptions>`				
`temperature_reset_type`	Type of temperature reset used by loop	`<TemperatureResetTypeOptions>`				
`outdoor_high_for_loop_supply_temperature_reset`	Outdoor high for loop supply temp reset	`Numeric`	C			Used when temperature_reset_type = OUTSIDE_AIR_RESET
`outdoor_low_for_loop_supply_temperature_reset`	Outdoor low for loop supply temp reset	`Numeric`	C			Used when temperature_reset_type = OUTSIDE_AIR_RESET
`loop_supply_temperature_at_outdoor_high`	Loop supply temperature at outdoor high temperature	`Numeric`	C			Used when temperature_reset_type = OUTSIDE_AIR_RESET
`loop_supply_temperature_at_outdoor_low`	Loop supply temperature at outdoor low temperature	`Numeric`	C			Used when temperature_reset_type = OUTSIDE_AIR_RESET
`loop_supply_temperature_at_low_load`	Loop supply temperature at low load	`Numeric`	C			Used when temperature_reset_type = LOAD_RESET

Pump

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
loop_or_piping	Referenced to the fluid loop or service water heating piping	$ID			✓	Constraint to use when implemented :FluidLoop: or :ServiceWaterPiping:
specification_method	Options for how the pump is specified	<PumpSpecificationMethodOptions>				
design_electric_power	Pump design electric power	Numeric	W			Pump electric power at design conditions. Only used when specification_method is set to Simple
motor_nameplate_power	Pump motor nameplate power	Numeric	W			Only used when specification_method is set to Detailed
design_head	Head of the pump at design flow conditions	Numeric	m			Only used when specification_method is set to Detailed
impeller_efficiency	Full load efficiency of the impeller	Numeric		≥0, ≤1		Only used when specification_method is set to Detailed
motor_efficiency	Full load efficiency of the pump motor	Numeric		≥0, ≤1		Only used when specification_method is set to Detailed
speed_control	Options for pump speed control	<PumpSpeedControlOptions>				
design_flow	Design Pump Flowrate	Numeric	L/s			
is_flow_autosized	True if the design_flow is autosized	Boolean				

Boiler

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`loop`	Referenced to the fluid loop	`$ID`			✓	Constraint to use when implemented :FluidLoop:
`design_capacity`	Heating capacity	`Numeric`	W			
`rated_capacity`	Heating capacity	`Numeric`	W			At rating conditions.
`minimum_load_ratio`	Minimum fraction of full load allowed	`Numeric`				
`draft_type`	Combustion option	`<BoilerCombustionOptions>`				
`energy_source_type`	Source of energy for the boiler	`<EnergySourceTypeOptions>`				
`efficiency_metric`	The type of efficiency metric used	`<BoilerEfficiencyMetricTypeOptions>`				
`efficiency`	Efficiency value based on the selected efficiency_metric	`Numeric`		≥0, ≤1		
`output_validation_points`	Energy validation points	`[{BoilerOutputValidationPoint}]`				Load is input to each validation point and energy output is the result. A minimum number of four points is recommended.
`auxiliary_power`	Auxiliary power	`Numeric`	W			Power for boiler pump, combustion fan, or other auxiliary that operates when boiler operates.
`operation_lower_limit`	Heating load range operation, lower limit	`Numeric`	W			
`operation_upper_limit`	Heating load range operation, upper limit	`Numeric`	W			

BoilerOutputValidationPoint

Name	Description	Data Type	Units	Range	Req	Notes
`load`	Load	`Numeric`	W			No name and id is needed since typically used as one of a series.
`result`	Result	`Numeric`	W			

Chiller

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
cooling_loop	Referenced to the cooling fluid loop	$ID			✓	Constraint to use when implemented :FluidLoop:
condensing_loop	Referenced to the condensing fluid loop	$ID				No condensing loop name implies air-cooled chiller. Constraint to use when implemented :FluidLoop:
compressor_type	Compressor Type	<ChillerCompressorTypeOptions>				
energy_source_type	Source of energy for the chiller	<EnergySourceTypeOptions>				
design_capacity	Chiller Design Cooling Capacity	Numeric	W			
rated_capacity	Chiller Rated Cooling Capacity	Numeric	W			At rating conditions.
minimum_load_ratio	Minimum fraction of full load allowed	Numeric				
design_flow_evaporator	Chiller evaporator design flow	Numeric	L/s			
design_flow_condenser	Chiller condenser design flow	Numeric	L/s			
full_load_efficiency	Full Low Efficiency expressed as a coefficient of performance (COP)	Numeric	W/W			
part_load_efficiency	Efficiency value based on the selected part_load_efficiency_metric	Numeric		≥0, ≤1		
part_load_efficiency_metric	The type of part load efficiency metric used	<ChillerPartLoadEfficiencyMetricTypeOptions>				
capacity_validation_points	Capacity validation points	[{ChillerCapacityValidationPoint}]				
power_validation_points	Energy validation points	[{ChillerPowerValidationPoint}]				
is_chilled_water_pump_interlocked	Indicates if the operation of the chilled water pump is interlocked with the operation of the chiller	Boolean				
is_condenser_water_pump_interlocked	Indicates if the operation of the condenser water pump is interlocked with the operation of the chiller	Boolean				

ChillerCapacityValidationPoint

Name	Description	Data Type	Units	Range	Req	Notes
chilled_water_supply_temperature	Chilled water supply temperature	Numeric	C			No name and id is needed since used as one of a series. The temperature is leaving the chiller.
condenser_temperature	Second temperature	Numeric	C			Outside air dry-bulb temperature for air cooled chillers and condenser water temperature for water cooled chillers. For water cooled chillers, this is the temperature as the water enters the chiller. For air cooled chilers this the temperature of the ambient air.
result	Result	Numeric	W			

ChillerPowerValidationPoint

Name	Description	Data Type	Units	Range	Req	Notes
`chilled_water_supply_temperature`	Chilled water supply temperature	`Numeric`	C			No name and id is needed since used as one of a series. The temperature is leaving the chiller.
`condenser_temperature`	Second temperature	`Numeric`	C			Outside air dry-bulb temperature for air cooled chillers and condenser water temperature for water cooled chillers. For water cooled chillers, this is the temperature as the water enters the chiller. For air cooled chilers this the temperature of the ambient air.
`load`	Load	`Numeric`	W			
`result`	Result	`Numeric`	W			

HeatRejection

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`loop`	Referenced to the fluid loop	`$ID`			✓	Constraint to use when implemented :FluidLoop:
`type`	Heat Rejection Type	`<HeatRejectionTypeOptions>`				
`fan_type`	Heat Rejection Fan Type	`<HeatRejectionFanTypeOptions>`				
`fluid`	Fluid Cooled by Heat Rejection	`<HeatRejectionFluidOptions>`				
`range`	Heat rejection Range	`Numeric`	C			
`approach`	Heat rejection Approach	`Numeric`	C			
`fan_power`	Fan Power	`Numeric`	W			
`fan_speed_control`	Fan Speed Control Type	`<HeatRejectionFanSpeedControlOptions>`				
`design_wetbulb_temperature`	Design wetbulb temperature	`Numeric`	C			0.4% ASHRAE MCWB
`design_water_flowrate`	Design condenser water flow rate	`Numeric`	L/s			
`rated_water_flowrate`	Rated condenser water flow rate	`Numeric`	L/s			At rating conditions.

ExternalFluidSource

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`loop`	Referenced to the fluid loop	`$ID`			✓	Constraint to use when implemented :FluidLoop:
`type`	Type of external fluid source	`<ExternalFluidSourceTypeOptions>`				
`energy_source_type`	Source of energy for the external fluid source	`<EnergySourceTypeOptions>`				

ServiceWaterHeatingDistributionSystem

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
design_supply_temperature	Design supply temperature setpoint of service water heating loop	Numeric	C			From CBECC-Com.
design_supply_temperature_difference	Design supply temperature difference (deltaT) of service water heating loop	Numeric	C			From CBECC-Com.
tanks	Tanks within service water heating distribution system	[{Tank}]				Contains a list of storage tanks that are part of this service water heating distribution system but not part of individual service water heaters.
is_central_system	Indicates whether it is a central service water heater distribution system	Boolean				From CBECC-Com.
service_water_piping	Other service water piping connected to this one as children.	[{ServiceWaterPiping}]				
distribution_compactness	Type of compact distribution system	<ServicewaterHeatingDistributionCompactness2019T24Com>				From CBECC-Com.
control_type	Type of distribution system	<ServicewaterHeatingControlType2019T24Com>				From CBECC-Com.
configuration_type	Type of configuration	<ServicewaterHeatingConfigurationType>				From CBECC-Com.
is_recovered_heat_from_drain_used_by_water_heater	Indicates whether the recovered heat from the shower drain used by the service water heater	Boolean				From CBECC-Res.
drain_heat_recovery_efficiency	Shower heat drain recovery efficiency	Numeric		≥0, ≤1		From CBECC-Com. May use the Canadian Standards Association Rated Recovery Efficiency.
drain_heat_recovery_type	Drain heat recovery type	<ServicewaterHeatingHeatRecoveryType>				From CBECC-Res.
flow_multiplier_schedule	service water heating Loop flow muliplier schedule name	$ID				Constraint to use when implemented :Schedule:
entering_water_mains_temperature_schedule	Temperature schedule for unheated entering water to the building site often referenced as mains temperature.	$ID				Constraint to use when implemented :Schedule:
is_ground_temperature_used_for_entering_water	Indicates whether ground temperature is the source of the entering water temperature	Boolean				

ServiceWaterPiping

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
is_recirculation_loop	Indicates if service water heating piping is a loop and recirculates	Boolean				
insulation_thickness	Pipe insulation thickness	Numeric	m	≥0		From CBECC-Com.
loop_pipe_location	Loop pipe location	<ComponentLocation>				From CBECC-Com.
location_zone	Zone reference of where the component is located when IN_ZONE is selected from ComponentLocation	$ID				From CBECC-Com. Constraint to use when implemented :Zone:
length	Pipe length	Numeric	m	≥0		From RESNET
diameter	Pipe section diameter	Numeric	m	≥0		From CBECC-Res.
child_service_water_piping	Other service water piping connected to this one as children.	[{ServiceWaterPiping}]				

SolarThermal

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`angle_from_true_north`	Solar heater angle from true north, clockwise	`Numeric`				From CBECC-Com.
`solar_savings_fraction`	Solar savings fraction	`Numeric`				Based on ICC-SRCC rating. From CBECC-Com.
`collector_area`	Solar collector area	`Numeric`				From CBECC-Com.
`collector_type_description`	Description of solar collector type	`String`				From CBECC-Com.
`collector_slope`	Solar slope from horizontal	`Numeric`				From CBECC-Com.
`tank`	Tank that is part of the solar thermal system	`{Tank}`				Contains a storage tank that is part of the solar thermal system.

ServiceWaterHeatingEquipment

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
heater_fuel_type	Service water heating heater fuel type	<EnergySourceTypeOptions>				
service_water_heating_distribution_system	Referenced to the service water heating distribution system	$ID			✓	Constraint to use when implemented :ServiceWaterHeatingDistributionSystem:
energy_factor	Energy factor	Numeric		≥0		From CBECC-Com.
thermal_efficiency	Service water heating heater thermal efficiency	Numeric		≥0		
standby_loss_fraction	Standby loss fraction	Numeric				From CBECC-Com.
uniform_energy_factor	Uniform energy factor	Numeric		≥0		From CBECC-Com.
first_hour_rating	First hour rating volume	Numeric	L	≥0		From CBECC-Com.
output_validation_points	Capacity validation points	[{ServiceWaterHeaterValidationPoint}]				
input_power	Input power	Numeric	W	≥0		From CBECC-Com.
rated_capacity	Rated capacity	Numeric	W			From CBECC-Com.
minimum_capacity	Minimum capacity	Numeric	W	≥0		From CBECC-Com.
recovery_efficiency	Recovery efficiency	Numeric				From CBECC-Com.
setpoint_temperature	Set point temperature	Numeric	C			
compressor_location	Description of where the heat pump for the water heater is located	String				Used when compressor is not located in a specific zone. From CBECC-Com.
compressor_zone	Zone reference of where the heat pump for the water heater is located	$ID				From CBECC-Com. Constraint to use when implemented :Zone:
compressor_heat_rejection_source	Heat pump heat rejection source	<ComponentLocation>				From CBECC-Res.
compressor_heat_rejection_zone	Heat pump heat rejection zone	$ID				From CBECC-Res. Constraint to use when implemented :Zone:
compressor_capacity_validation_points	Capacity validation points	[{HeatPumpWaterHeaterCapacityValidationPoint}]				
compressor_power_validation_points	Coefficient of performance validation points	[{HeatPumpWaterHeaterPowerValidationPoint}]				
draft_fan_power	Power for the draft fan	Numeric	W	≥0		From CBECC-Com.
has_electrical_ignition	Indicates whether the water heater has electrical ignition	Boolean				From CBECC-Com.
heater_type	Service water heater type	<ServiceWaterHeaterType>				
tank	Tank that is part of the service water heating equipment	{Tank}				Contains a storage tank that is part of the service water heating equipment.
status_type	Choice of new, existing, addition, alteration, etc. for each ruleset.	<GeneralStatusType2019T24>				
solar_thermal_systems	Solar thermal systems used for heating service water	[{SolarThermal}]				Contains a list of Solar thermal systems that are part of this service water heating distribution system.
hot_water_loop	Referenced to the hot water fluid loop	$ID				Can be used when heat is supplied to service water heater from a hot water loop or when combination service water and space heating is used. Constraint to use when implemented :FluidLoop:

ServiceWaterHeaterValidationPoint

Name	Description	Data Type	Units	Range	Req	Notes
load	Load	Numeric	W			No name and id is needed since typically used as one of a series.
result	Result	Numeric	W			

HeatPumpWaterHeaterCapacityValidationPoint

Name	Description	Data Type	Units	Range	Req	Notes
`evaporator_air_temperature`	Outside dry bulb temperatures of air	`Numeric`	C			No name and id is needed since used as one of a series.
`condenser_water_temperature`	Entering condenser temperature of water	`Numeric`	C			
`evaporator_air_flow`	Air flow across evaporator	`Numeric`	L/s			
`condenser_water_flow`	Water flow across condenser	`Numeric`	L/s			
`result`	Result	`Numeric`	W			

HeatPumpWaterHeaterPowerValidation Point

Name	Description	Data Type	Units	Range	Req	Notes
`evaporator_air_temperature`	Outside dry bulb temperatures of air	`Numeric`	C			No name and id is needed since used as one of a series.
`condenser_water_temperature`	Entering condenser temperature of water	`Numeric`	C			
`evaporator_air_flow`	Air flow across evaporator	`Numeric`	L/s			
`condenser_water_flow`	Water flow across condenser	`Numeric`	L/s			
`load`	Load	`Numeric`	W			
`result`	Result	`Numeric`	W			

Tank

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`storage_capacity`	Storage capacity of tank in distribution system	`Numeric`	L	≥0		From CBECC-Com.
`type`	Service water heater tank type	`<ServiceWaterHeaterTankType>`				
`height`	Tank height	`Numeric`	m	≥0		From CBECC-Com.
`interior_insulation`	Tank interior insulation R-value	`Numeric`	K-m2/W	≥0		Insulation that is part of the tank and is inside of the housing. From CBECC-Res.
`exterior_insulation`	Tank interior insulation R-value	`Numeric`	K-m2/W	≥0		A blanket of insulation that surrounds the exterior of the tank. From CBECC-Res.
`location`	Location	`<ComponentLocation>`				From CBECC-Res.
`location_zone`	Tank zone location	`$ID`				Only used when tank_location indicates the tank is located in a zone. From CBECC-Res. Constraint to use when implemented :Zone:

ServiceWaterHeatingUse

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`area_type`	Service Water Heating Loop Area Type	`<ServiceWaterHeatingSpaceType2019ASHRAE901>`				The enumeration is based on the standard used.
`water_serves_type`	The use of the water serves the type	`<ServiceWaterHeatingFixtureType>`				
`served_by_distribution_system`	ID fo the ServiceWaterHeatingDistributionSystem that serves this end use	`$ID`				From CBECC-Res. Constraint to use when implemented :ServiceWaterHeatingDistributionSystem:
`use`	Usage of service hot water	`Numeric`				
`use_units`	Type of units for use of service hot water	`<ServiceWaterHeatingUseUnits>`				
`use_multiplier_schedule`	Reference to the schedule containing the multiplier for the use of service hot water	`$ID`			✓	Constraint to use when implemented :Schedule:
`temperature_at_fixture`	Reference to the schedule containing the multiplier for the use of service hot water	`Numeric`	C			From RESNET
`is_heat_recovered_by_drain`	Indicates if heat is being recovered from the drain	`Boolean`				From CBECC-Res.
`is_recovered_heat_used_by_cold_side_feed`	Indicates if heat is being recovered from the drain is used on the cold side feed	`Boolean`				From CBECC-Res.

ExteriorLighting

Name	Description	Data Type	Units	Range	Req	Notes
`id`	Scope-unique reference identifier for instances of this data group	`ID`			✓	
`reporting_name`	Descriptive name used in RCT reports if id is not already a descriptive name	`String`				
`notes`	Supplementary information to provide context to the model reviewer	`String`				
`type`	The type of exterior lighting fixture none	`<ExteriorLightingAreas2019ASHRAE901TableG36>`				
`area`	Area of the exterior functional space.	`Numeric`	m2	>0		
`length`	Linear length measure for exterior functional space	`Numeric`	m	≥0		For example, used when expressing street frontage or door width
`power`	Nominal power of exterior lighting fixtures	`Numeric`	W	>0		
`fixture_height`	Installation height of exterior fixture	`Numeric`	m	>0		
`is_exempt`	Indicates whether the exterior lighting is exempted from requirements	`Boolean`				
`multiplier_schedule`	Reference to the schedule containing the multiplier for exterior lighting	`$ID`			✓	Constraint to use when implemented :Schedule:

Refrigeration

Name	Description	Data Type	Units	Range	Req	Notes
id	Scope-unique reference identifier for instances of this data group	ID			✓	
reporting_name	Descriptive name used in RCT reports if id is not already a descriptive name	String				
notes	Supplementary information to provide context to the model reviewer	String				
type	Refrigeration equipment type	<RefrigerationType>				
equipment_category	Equipment Class from referenced standard	<RefrigerationCategory>				
is_self_contained	Indicates whether unit is self-contained	Boolean				If not self-contained, show as false, and indicates that it has remote condenser
application_temperature	Equipment application temperature	<ApplicationTemperatureType>				Based on AHRI 1200
power	Nominal power of refrigeration	Numeric	W	>0		
power_multiplier_schedule	Refrigeration power multiplier schedule name	$ID				Constraint to use when implemented :Schedule:
sensible_fraction	Fraction of energy that is a sensible load on the space.	Numeric		≥-1, ≤1		
heat_gain_fraction	Fraction of energy that is a heat gain to the space.	Numeric		≥-1, ≤1		
case_volume	volume of a refrigerated case in cubic meters	Numeric	m3			
total_display_area	display area of a refrigerated case in square meters	Numeric	m2			
case_zone	Zone where case is located	$ID				