

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 referencable identification for a data group and sequence of characters of any length using any (specified) character set. | string | AHU-01 |
| Reference | A reference to an ID of a data group. | string | AHU-01 |
| Null | Indicator that no value is provided. Only used in combination with other data types, e.g., 'Number/Null'. | null | null |

String Types

| String Type | Description | JSON Schema Pattern | Examples |
|-------------|--|---|-------------------|
| Timestamp | Date with UTC time formatted per ISO 8601 (ISO 2004) | [0-9]{4}-[0-9]{2}-[0-9]{2}T[0-9]{2}:[0-9]{2}Z | 2016-06-29T14:35Z |

ConditioningOptions

| Enumerator | Description | Notes |
|-------------------|-------------------|-------|
| HEATED_AND_COOLED | Heated and cooled | |
| HEATED_ONLY | Heated only | |
| SEMIHEATED | Semiheated | |

| Enumerator | Description | Notes |
|---------------|---------------|-------|
| UNCONDITIONED | Unconditioned | |

SpaceFunctionOptions

| Enumerator | Description | Notes |
|------------|-------------|-------|
| LABORATORY | Laboratory | |
| KITCHEN | Kitchen | |
| OTHER | Other | |

StatusOptions

| Enumerator | Description | Notes |
|-------------------|-------------------|-------|
| NEW | New | |
| EXISTING | Existing | |
| EXISTING_PLUS_NEW | Existing plus new | |
| ALTERED | Altered | |
| OTHER | Other | |

InfiltrationMethodOptions

| 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. | |

InsulationLocationOptions

| Enumerator | Description | Notes |
|---------------------------------------|---|-------|
| ABOVE_GROUND_WALL_EXTERIOR_CONTINUOUS | Continuous insulation on exterior of an above ground wall | |
| ABOVE_GROUND_WALL_INTERIOR_CONTINUOUS | Continuous insulation on interior of an above ground wall | |
| ABOVE_GROUND_WALL_FULL_CAVITY | Insulation within the cavity of an above ground wall that fills the entire cavity | |
| ABOVE_GROUND_WALL_PARTIAL_CAVITY | Insulation within the cavity of an above ground wall that fills only part of the cavity | |
| SLAB_HORIZONTAL_PERIMETER | Insulation on underside of the slab covering the perimeter | |
| SLAB_HORIZONTAL_FULL | Insulation fully covering the underside of the slab | |
| SLAB_VERTICAL | Insulation applied vertically next to edge of slab | |
| NONE | None | |
| OTHER | Other | |

SurfaceClassificationOptions

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

SurfaceAdjacencyOptions

| 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. | |

| Enumerator | Description | Notes |
|------------|--|-------|
| INTERIOR | Interior surface if adjacent to another space which is explicitly modeled. | |
| IDENTICAL | Surface adjacent to an environment identical to the space. Sometimes this is described as an adiabatic surface since no heat is transferred. The space on the other side of the surface is not explicitly 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. | |

SubsurfaceClassificationOptions

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

SubsurfaceDynamicGlazingOptions

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

LightingDaylightingControlOptions

| Enumerator | Description | Notes |
|------------|-------------|-------|
| STEPPED | Stepped | |

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

LightingOccupancyControlOptions

| 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. |

MiscellaneousEquipmentOptions

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

TransformerOptions

| Enumerator | Description | Notes |
|--------------|--------------|-------|
| DRY_TYPE | Dry Type | |
| FLUID_FILLED | Fluid Filled | |
| OTHER | Other | |

ElectricalPhaseOptions

| Enumerator | Description | Notes |
|--------------|--------------|-------|
| SINGLE_PHASE | Single Phase | |
| THREE_PHASE | Three Phase | |

ScheduleSequenceOptions

| Enumerator | Description | Notes |
|------------|-------------|-------|
| HOURLY | Hourly | |
| EVENT | Event | |

ScheduleOptions

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

DayOfWeekOptions

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

WeatherFileDataSourceOptions

| 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 | |

CoolingDesignDayOptions

| Enumerator | Description | Notes |
|-------------|---|-------|
| COOLING_0_4 | Cooling design day 0.4% annual cumulative frequency of occurrence | |
| COOLING_1_0 | Cooling design day 1.0% annual cumulative frequency of occurrence | |
| COOLING_2_0 | Cooling design day 2.0% annual cumulative frequency of occurrence | |

HeatingDesignDayOptions

| Enumerator | Description | Notes |
|--------------|--|-------|
| HEATING_99_6 | Heating design day 99.6% annual cumulative frequency of occurrence | |
| HEATING_99_0 | Heating design day 99.0% annual cumulative frequency of occurrence | |

ElevatorOptions

| Enumerator | Description | Notes |
|------------|-------------|-------|
| HYDRAULIC | Hydraulic | |
| TRACTION | Traction | |
| OTHER | Other | |

HeatingSystemOptions

| Enumerator | Description | Notes |
|---------------------|---------------------|-------|
| HEAT_PUMP | Heat Pump | |
| FURNACE | Furnace | |
| ELECTRIC_RESISTANCE | Electric resistance | |
| FLUID_LOOP | Fluid loop | |
| NONE | None | |
| OTHER | Other | |

HeatpumpAuxilliaryHeatOptions

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

HumidificationOptions

| Enumerator | Description | Notes |
|------------|-------------|-------|
| ADIABATIC | Adiabatic | |
| NONE | None | |
| OTHER | Other | |

HeatingMetricOptions

| Enumerator | Description | Notes |
|---|---|-------|
| HEAT_PUMP_COEFFICIENT_OF_PERFORMANCE_HIGH_TEMPERATURE | Efficiency at 8.3C/47F dry bulb and 6.1C/43F wet bulb | |

| Enumerator | Description | Notes |
|--|--|--|
| HEAT_PUMP_COEFFICIENT_OF_PERFORMANCE_LOW_TEMPERATURE | Efficiency at -8.3C/17F dry bulb and -9.4C/15F wet bulb | |
| HEAT_PUMP_COEFFICIENT_OF_PERFORMANCE_HIGH_TEMPERATURE_NO_FAN | Efficiency at 8.3C/47F dry bulb and 6.1C/43F wet bulb not including fan | Used for heat pump and describes the efficiency not including the indoor supply fan. The outdoor evaporator fan power is generally included. |
| HEAT_PUMP_COEFFICIENT_OF_PERFORMANCE_LOW_TEMPERATURE_NO_FAN | Efficiency at -8.3C/17F dry bulb and -9.4C/15F wet bulb not including fan | Used for heat pump and describes the efficiency not including the indoor supply fan. The outdoor evaporator fan power is generally included. |
| THERMAL_EFFICIENCY | Et - thermal efficiency | |
| COMBUSTION_EFFICIENCY | Ec - combustion` efficiency | |
| ANNUAL_FUEL_UTILIZATION_EFFICIENCY | AFUE - annual fuel utilization efficiency | |
| HEATING_SEASONAL_PERFORMANCE_FACTOR | HSPF - heating seasonal performance factor | |
| HEATING_SEASONAL_PERFORMANCE_FACTOR_2 | HSPF2 - heating seasonal performance factor 2 | |
| COEFFICIENT_OF_PERFORMANCE_WATER_TO_AIR_WATER_LOOP | Coefficient of performance at entering temperature of 20C/68F rated conditions for water loops per ISO 13256-1 | |

| Enumerator | Description | Notes |
|--|---|-------|
| COEFFICIENT_OF_PERFORMANCE_WATER_TO_AIR_GROUND_WATER | Coefficient of performance at entering temperature of 10C/50F rated conditions for ground water per ISO 13256-1 | |
| COEFFICIENT_OF_PERFORMANCE_BRINE_TO_AIR_GROUND_LOOP | Coefficient of performance at entering temperature of 0C/32F rated conditions for ground water per ISO 13256-1 | |
| COEFFICIENT_OF_PERFORMANCE_WATER_TO_WATER_WATER_LOOP | Coefficient of performance at entering temperature of 20C/68F rated conditions for water loops per ISO 13256-2 | |
| COEFFICIENT_OF_PERFORMANCE_WATER_TO_WATER_GROUND_WATER | Coefficient of performance at entering temperature of 10C/50F rated conditions for ground water per ISO 13256-2 | |
| COEFFICIENT_OF_PERFORMANCE_BRINE_TO_WATER_GROUND_LOOP | Coefficient of performance at entering temperature of 0C/32F rated conditions for ground water per ISO 13256-2 | |
| NONE | None | |
| OTHER | Other | |

CoolingSystemOptions

| Enumerator | Description | Notes |
|------------------|------------------|-------|
| DIRECT_EXPANSION | Direct expansion | |

| Enumerator | Description | Notes |
|----------------|----------------|-------|
| FLUID_LOOP | Fluid loop | |
| NON_MECHANICAL | Non-mechanical | |
| NONE | None | |
| OTHER | Other | |

DehumidificationOptions

| Enumerator | Description | Notes |
|----------------------|----------------------|-------|
| MECHANICAL_COOLING | Mechanical cooling | |
| DESICCANT | Desiccant | |
| SERIES_HEAT_RECOVERY | Series heat recovery | |
| NONE | None | |
| OTHER | Other | |

CoolingMetricOptions

| Enumerator | Description | Notes |
|---|---|---|
| FULL_LOAD_COEFFICIENT_OF_PERFORMANCE | Full load efficiency expressed as a coefficient of performance at 35C/95F rated conditions | |
| FULL_LOAD_COEFFICIENT_OF_PERFORMANCE_NO_FAN | Full load efficiency expressed as a coefficient of performance at 35C/95F rated conditions not including indoor fan power | Describes the efficiency not including the indoor supply fan. The outdoor evaporator fan power is generally included. |
| ENERGY EFFICIENCY_RATIO | EER - Energy efficiency ratio | |
| SEASONAL_ENERGY EFFICIENCY_RATIO | SEER - Seasonal energy efficiency ratio | |

| Enumerator | Description | Notes |
|--|---|-------|
| SEASONAL_ENERGY_EFFICIENCY_RATIO_2 | SEER2 - Seasonal energy efficiency ratio 2 | |
| INTEGRATED_ENERGY_EFFICIENCY_RATIO | IEER - Integrated energy efficiency ratio | |
| INTEGRATED_PART_LOAD_VALUE | IPLV - Integrated part load value | |
| COMBINED_ENERGY_EFFICIENCY_RATIO | CEER - Combined energy efficiency ratio | |
| COEFFICIENT_OF_PERFORMANCE_WATER_TO_AIR_WATER_LOOP | Coefficient of performance at entering temperature of 30C/86F rated conditions for water loops per ISO 13256-1 | |
| COEFFICIENT_OF_PERFORMANCE_WATER_TO_AIR_GROUND_WATER | Coefficient of performance at entering temperature of 15C/59F rated conditions for ground water per ISO 13256-1 | |
| COEFFICIENT_OF_PERFORMANCE_BRINE_TO_AIR_GROUND_LOOP | Coefficient of performance at entering temperature of 25C/77F rated conditions for ground water per ISO 13256-1 | |
| COEFFICIENT_OF_PERFORMANCE_WATER_TO_WATER_WATER_LOOP | Coefficient of performance at entering temperature of 30C/86F rated conditions for water loops per ISO 13256-2 | |

| Enumerator | Description | Notes |
|--|---|-------|
| COEFFICIENT_OF_PERFORMANCE_WATER_TO_WATER_GROUND_WATER | Coefficient of performance at entering temperature of 15C/59F rated conditions for ground water per ISO 13256-2 | |
| COEFFICIENT_OF_PERFORMANCE_BRINE_TO_WATER_GROUND_LOOP | Coefficient of performance at entering temperature of 25C/77F rated conditions for ground water per ISO 13256-2 | |
| NONE | None | |
| OTHER | Other | |

FanSystemTemperatureControlOptions

| 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 | |

FanSystemSupplyFanControlOptions

| Enumerator | Description | Notes |
|----------------------|----------------------|-------|
| CONSTANT | Constant | |
| VARIABLE_SPEED_DRIVE | Variable speed drive | |
| MULTISPEED | Multispeed | |

| Enumerator | Description | Notes |
|------------------|------------------|-------|
| INLET_VANE | Inlet vane | |
| DISCHARGE_DAMPER | Discharge damper | |
| OTHER | Other | |

FanSystemOperationOptions

| Enumerator | Description | Notes |
|------------|-------------|-------|
| CYCLING | Cycling | |
| CONTINUOUS | Continuous | |
| KEEP_OFF | Off | |
| OTHER | Other | |

FanSystemSupplyFanVolumeResetOptions

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

AirEconomizerOptions

| 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 | |

EnergyRecoveryOptions

| Enumerator | Description | Notes |
|------------------------|------------------------|-------|
| SENSIBLE_HEAT_EXCHANGE | Sensible heat exchange | |
| ENTHALPY_HEAT_EXCHANGE | Enthalpy heat exchange | |
| SENSIBLE_HEAT_WHEEL | Sensible heat wheel | |
| ENTHALPY_HEAT_WHEEL | Enthalpy heat wheel | |
| HEAT_PIPE | Heat pipe | |
| OTHER | Other | |
| NONE | None | |

EnergyRecoveryOperationOptions

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

EnergyRecoverySupplyAirTemperatureControlOptions

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

DemandControlVentilationControlOptions

| 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 |

TerminalOptions

| Enumerator | Description | Notes |
|---------------------|---------------------|-------|
| VARIABLE_AIR_VOLUME | Variable air volume | |
| CONSTANT_AIR_VOLUME | Constant air volume | |
| RADIANT | Radiant | |
| BASEBOARD | Baseboard | |
| OTHER | Other | |

TerminalFanConfigurationOptions

| Enumerator | Description | Notes |
|------------|-------------|-------|
| PARALLEL | Parallel | |
| SERIES | Series | |
| OTHER | Other | |

TerminalTemperatureControlOptions

| Enumerator | Description | Notes |
|-------------------------------------|-------------------------------------|-------|
| CONSTANT | Constant | |
| LOAD_RESET_DIFFERENTIAL_TEMPERATURE | Load Reset Differential Temperature | |
| SCHEDULED | Scheduled | |
| OTHER | Other | |

HeatingSourceOptions

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

CoolingSourceOptions

| Enumerator | Description | Notes |
|---------------|---------------|-------|
| CHILLED_WATER | Chilled water | |
| NONE | None | |
| OTHER | Other | |

FluidLoopFlowControlOptions

| Enumerator | Description | Notes |
|---------------|---------------|-------|
| FIXED_FLOW | Fixed flow | |
| VARIABLE_FLOW | Variable flow | |

FluidLoopOptions

| Enumerator | Description | Notes |
|------------|-------------|-------|
| HEATING | Heating | |

| Enumerator | Description | Notes |
|---------------------|---------------------|-------|
| COOLING | Cooling | |
| HEATING_AND_COOLING | Heating and cooling | |
| CONDENSER | Condenser | |
| OTHER | Other | |

TemperatureResetOptions

| Enumerator | Description | Notes |
|-------------------|-------------------|-------|
| NO_RESET | No Reset | |
| 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 |

| Enumerator | Description | Notes |
|------------|-------------|---|
| DETAILED | Detailed | Specify the motor nameplate power, design head, impellor efficiency, motor efficiency |

BoilerCombustionOptions

| Enumerator | Description | Notes |
|------------|-------------|-------|
| NATURAL | Natural | |
| FORCED | Forced | |

BoilerEfficiencyMetricOptions

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

ChillerPartLoadEfficiencyMetricOptions

| 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 | |

ChillerCompressorOptions

| Enumerator | Description | Notes |
|---------------|---------------|-------|
| SCREW | Screw | |
| CENTRIFUGAL | Centrifugal | |
| RECIPROCATING | Reciprocating | |
| SCROLL | Scroll | |

| Enumerator | Description | Notes |
|---|---|-------|
| 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 | |

HeatRejectionOptions

| 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 | |

HeatRejectionFanOptions

| Enumerator | Description | Notes |
|-------------|--------------------|-------|
| AXIAL | Axial or Propellor | |
| CENTRIFUGAL | Centrifugal | |
| OTHER | Other | |

HeatRejectionFluidOptions

| Enumerator | Description | Notes |
|------------|-------------|-------|
| WATER | Water | |

| Enumerator | Description | Notes |
|-------------|-------------|------------------|
| 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 | |

ExternalFluidSourceOptions

| Enumerator | Description | Notes |
|---------------|---------------|-------|
| CHILLED_WATER | Chilled water | |
| HOT_WATER | Hot water | |
| STEAM | Steam | |

ServiceWaterHeatingConfigurationOptions

| 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 | |

| Enumerator | Description | Notes |
|---|---|-------|
| 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 | |

ServiceWaterHeatingHeatRecoveryOptions

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

ServiceWaterHeaterOptions

| Enumerator | Description | Notes |
|--------------------|--------------------|-------|
| CONVENTIONAL | Conventional | |
| HEAT_PUMP_PACKAGED | Heat pump packaged | |

| Enumerator | Description | Notes |
|-------------------------------|---|--|
| HEAT_PUMP_SPLIT | Heat pump split | |
| HEAT_FROM_HOT_WATER_LOOP | Heat from hot water loop | Should also specify hot water loop when this is used |
| COMBINATION_SERVICE_AND_SPACE | Combination space and service water heater. | Should also specify hot water loop when this is used |
| OTHER | Other | |

ComponentLocationOptions

| 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 | |

ServiceWaterHeaterTankOptions

| 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 |

| Enumerator | Description | Notes |
|---|--|----------|
| RESIDENTIAL_DUTY_COMMERCIAL_INSTANTANEOUS | Residential-Duty Commercial Instantaneous | Uses UEF |
| INDIRECT | Indirect | |
| BOILER | Boiler | |
| COMMERCIAL_PACKAGED_BOILER | Commercial Packaged Boiler | |
| OTHER | Other | |

ServiceWaterHeatingFixtureOptions

| 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 | |

ServiceWaterHeatingUseUnitOptions

| 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 | |

EnergySourceOptions

| 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 | |

RefrigeratedCaseOptions

| 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 | |

RefrigeratedCaseEquipmentCategoryOptions

| Enumerator | Description | Notes |
|-----------------------|-----------------------|-------|
| HORIZONTAL_OPEN | Horizontal open | |
| HORIZONTAL_SOLID_DOOR | Horizontal solid door | |

| Enumerator | Description | Notes |
|-----------------------------|-----------------------------|-------|
| 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 | |

ApplicationTemperatureOptions

| 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) |
| VERY_LOW | Very low | -26.1 C +/- 1.1 C (-15 F +/- 2 F). This corresponds to the ice cream category in AHRI 1200 |
| OTHER | Other | |

RulesetProjectDescription

| Name | Description | Data Type | Units | Range | Req | Notes |
|----------------|--|-----------|-------|-------|-----|--|
| id | Scope-unique reference identifier for instances of this data group. | ID | | | ✓ | All id data elements are shown as required so that every data group can be explicitly identified. Almost no other data elements are shown as required but they may be required by specific rulesets. |
| 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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| data_timestamp | Date and time of data publication | Timestamp | | | ✓ | Date and time of publication of the data |
| data_version | Integer version identifier for the data | Integer | | ≥1 | | Used by data publisher to track revisions of the data and shall be incremented for each data revision |

| Name | Description | Data Type | Units | Range | Req | Notes |
|----------------------------|---|---|-------|-------|-----|--|
| ruleset_model_descriptions | A list of the ruleset model descriptions within the project each with a unique ruleset_model_type. | [[RulesetModelDescription]] | | | ✓ | For submissions with ruleset model descriptions (i.e., user, proposed, baseline,...) generated as separate files, only one model description would be defined for each ASHRAE229 ruleset project description json file. For submissions where the software always produces all ruleset model descriptions together, multiple model descriptions would appear in the same ASHRAE229 ruleset project description json file. Some rulesets may restrict the submission process including the number of files and number of model descriptions per file. Multiple model descriptions may be required by rulesets that require models at various tiers or levels of performance. Model descriptions may also be used by References between data groups and are restricted to be within the same ruleset model description. For 90.1-2019 appendix G model descriptions would be created for the following models: user, proposed, baseline at 0 degrees, baseline at 90 degrees, baseline at 180 degrees, and baseline at 270 degrees. All IDs within a ruleset model description should be unique for each type of data group. Between ruleset model descriptions, IDs should be the same for the same component. For example, a Surface with an ID of LobbyFrontSurface is very likely to have the same geometry for all ruleset model descriptions except perhaps the azimuth so that surface should have the ID LobbyFrontSurface for all ruleset model descriptions. |
| 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 | <CompliancePathOptions2019ASHRAE901> | | | | |
| output_format_type | Indicates the chosen format for output | (<OutputSchemaOptions2019ASHRAE901>, <OutputSchemaOptions2019T24>, OutputSchemaOptionsRESNET) | | | | |

RulesetModelDescription

| 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 | | | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|--|--|--|-------|-------|-----|---|
| notes | Supplementary information to provide context to the model reviewer | String | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| type | Describes the current ruleset model description for rulesets with multiple simulation models | <RulesetModelOptions2019ASHRAE901>,<RulesetModelOptionsRESNET>,<RulesetModelOptions2019T24Com>,<RulesetModelOptions2019T24Res> | | | ✓ | Will usually designate which simulation this RulesetModelDescription refers to such as: PROPOSED, BASELINE_0, USER, RATED, REFERENCE |
| 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. For the model of actual building value this value would be measured but for created baseline or reference model this could be an assumed value. |
| 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 | | | | |
| 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}} | | | | |
| boilers | Boilers used on the site | {{Boiler}} | | | | |
| chillers | Chillers used on the site | {{Chiller}} | | | | |
| heat_rejections | HeatRejections used on the site | {{HeatRejection}} | | | | |
| external_fluid_sources | ExternalFluidSources used on the site | {{ExternalFluidSource}} | | | | The sources of energy, such as district chilled water, district hot water, and district steam. |
| site_zone_type | Site zone type for Sec 9.4.2 | <ExteriorLightingZoneOptions2019ASHRAE901> | | | | The site designation type for exterior lighting classification. |
| output | Output | {{Output2019ASHRAE901}} | | | | |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |

| Name | Description | Data Type | Units | Range | Req | Notes |
|---|---|-----------------------------------|-------|----------|-----|---|
| <code>building_segments</code> | Large portions of a building that share a building area type | <code>[{BuildingSegment}]</code> | | | | Contains a list of building segments in the building. |
| <code>elevators</code> | Elevators | <code>[{Elevator}]</code> | | | | Contains a list of elevators in the building. |
| <code>exterior_lighting</code> | Exterior lighting systems | <code>[{ExteriorLighting}]</code> | | | | Contains a list of exterior lighting systems for the building. |
| <code>refrigerated_cases</code> | Refrigerated cases | <code>[{RefrigeratedCase}]</code> | | | | Contains a list of refrigerated cases in the building. |
| <code>building_open_schedule</code> | Reference to the schedule indicating when the building is open | <code>Reference</code> | | | | One represent when the building is open and zero when closed. If the schedule is not present, 24 hour operation is assumed. Constraint to use when implemented :Schedule: |
| <code>has_site_shading</code> | Indicates whether the site has features that cast shadows on the building | <code>Boolean</code> | | | | |
| <code>number_of_floors_above_grade</code> | Number of floors above grade | <code>Numeric</code> | | ≥ 0 | | For the entire building including all building segments. Includes only floors that are not devoted solely to parking or unconditioned space. |
| <code>number_of_floors_below_grade</code> | Number of floors below grade | <code>Numeric</code> | | ≥ 0 | | For the entire building including all building segments. Includes only floors that are not devoted solely to parking or unconditioned space. |

BuildingSegment

| Name | Description | Data Type | Units | Range | Req | Notes |
|---|--|----------------------|-------|----------|-----|--|
| <code>id</code> | Scope-unique reference identifier for instances of this data group | <code>ID</code> | | | ✓ | |
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | <code>String</code> | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>number_of_floors_above_grade</code> | Number of floors above grade | <code>Numeric</code> | | ≥ 0 | | For the portion of the building represented by the BuildingSegment. |
| <code>number_of_floors_below_grade</code> | Number of floors below grade | <code>Numeric</code> | | ≥ 0 | | For the portion of the building represented by the BuildingSegment. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|---|---|---|-------|-------|-----|---|
| 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 segment | [[Zone]] | | | | Contains a list of zones in the building. |
| heating_ventilating_air_conditioning_systems | HVAC systems in the building segment | [(HeatingVentilatingAirConditioningSystem)] | | | | Contains a list of HVAC systems in the building. |
| area_type_vertical_fenestration | Building area classification used for vertical fenestration | <VerticalFenestrationBuildingAreaOptions2019ASHRAE90L> | | | | The enumeration is based on the standard used. |
| lighting_building_area_type | Building area lighting area type | <LightingBuildingAreaOptions2019ASHRAE90LIT95ITC38> | | | | The lighting building area type for the building segment. If used, options are provided in the ruleset specific enumerations. This data element may also be used for determining the building area type for other purposes such as target setting targets (like 90.1 building performance factors) so it should be completed even when the lighting building area method is not used. |
| area_type_heating_ventilating_air_conditioning_system | Classification used for HVAC | <HeatingVentilatingAirConditioningBuildingAreaOptions2019ASHRAE90L> | | | | The enumeration is based on the standard used. |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| 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. |
| 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 | <ConditioningOptions> | | | | |
| infiltration | Airleakage into the zone. | {Infiltration} | | | | References a single infiltration data group. If a zone includes multiple spaces and infiltration is specified at the space level the rates and schedules should be aggregated to the zone. |
| design_thermostat_cooling_setpoint | Setpoint temperature for cooling during occupied hours | Numeric | C | | | The cooling setpoint temperature for the zone at design conditions. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|--|--|--------------|-------|------------------------|-----|--|
| thermostat_cooling_setpoint_schedule | Reference to the schedule containing the cooling setpoint temperatures | Reference | | | | If the schedule is not present, the design thermostat cooling setpoint is assumed to be constant. Constraint to use when implemented :Schedule: |
| design_thermostat_heating_setpoint | Setpoint temperature for heating during occupied hours | Numeric | C | | | The heating setpoint temperature for the zone at design conditions. |
| thermostat_heating_setpoint_schedule | Reference to the schedule containing the heating setpoint temperatures | Reference | | | | If the schedule is not present, the design thermostat heating setpoint is assumed to be constant. Constraint to use when implemented :Schedule: |
| minimum_humidity_setpoint_schedule | Reference to the schedule containing the minimum relative humidity setpoint | Reference | | ≥ 0 , ≤ 1 | | For schedule values use relative humidity expressed on a 0 to 1 scale. Constraint to use when implemented :Schedule: |
| maximum_humidity_setpoint_schedule | Reference to the schedule containing the maximum relative humidity setpoint | Reference | | ≥ 0 , ≤ 1 | | For schedule values use relative humidity expressed on a 0 to 1 scale. 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. |
| served_by_service_water_heating_system | A service water heating system serving the zone | Reference | | | | 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. |
| transfer_airflow_source_zone | ID of the source zone for transfer air. | Reference | | | | Constraint to use when implemented :Zone: |
| zonal_exhaust_fan | Zonal exhaust fan | {Fan} | | | | References a fan that is used to exhaust air from the zone. The fan should be configured to not be connected from any other HVAC data group. |
| exhaust_airflow_rate_multiplier_schedule | Reference to the schedule containing the multiplier for the exhaust airflow rate | Reference | | | | If the schedule is not present, the multiplier is always one. Constraint to use when implemented :Schedule: |
| makeup_airflow_rate | Airflow rate for makeup air | Numeric | L/s | ≥ 0 | | |
| non_mechanical_cooling_fan_power | Non-mechanical cooling fan power | Numeric | W | ≥ 0 | | The power consumed by a fan used in a non-mechanical cooling device such as a ceiling fan. |
| non_mechanical_cooling_fan_airflow | Non-mechanical cooling fan airflow | Numeric | L/s | ≥ 0 | | The airflow of a fan used in a non-mechanical cooling device such as a ceiling fan. |
| air_distribution_effectiveness | Air distribution effectiveness | Numeric | | ≥ 0 | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|--------------------|--------------------|-----------|-------|-------|-----|---|
| aggregation_factor | Aggregation factor | Numeric | | ≥1 | | A factor that has already been applied when modeling a zone that represents an aggregation of several individual zones shown on design documents. For example, if five dwelling units facing the same orientation are modeled as a single zone, the total volume of the zone and the total surface area of the zone should be five times the values of a single dwelling unit shown on the design documents and aggregation_factor should be set to 5. Another example, when three identical floors are modeled, the zones modeled for these floors should represent the volume of the zone on three floors, and the aggregation_factor should be set to 3. A final example would be a big box retail store with eight units serving the core zone, the total floor area of the spaces in the core zone should already account for the total area, and the aggregation_factor should be set to 8. The factor is chiefly used to determine the size range for heating and cooling equipment serving that zone. Used only to confirm the individual size of heating or cooling units serving the zone so that the efficiency for that size range can be looked up in tables of equipment efficiency by size range. By dividing the heating and cooling capacity of the zone by the aggregation_factor, the result would indicate the capacity of the individual units represented by equipment. For zones not representing any type of aggregation, this value should be one. The aggregation_factor is typically an integer but occasionally may include a fractional value. The total area of the spaces and the volume of the zone should already be multiplied by the factor. |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| interior_lighting | Internal lighting that produce internal gains for a space. | [[InteriorLighting]] | | | | References one or more InteriorLighting data groups that collectively define all interior lighting within the space. |
| miscellaneous_equipment | Miscellaneous equipment loads that produce internal gains for a space. | [[MiscellaneousEquipment]] | | | | References one or more MiscellaneousEquipment that collectively describe all of the miscellaneous equipment in the space. |
| 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. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|----------------------------------|---|--|-------|-------|-----|---|
| 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 | Reference | | | | If the schedule is not present, the multiplier is always one. Constraint to use when implemented :Schedule: |
| occupant_sensible_heat_gain | Sensible heat gain of each occupant. | Numeric | W | ≥0 | | |
| occupant_latent_heat_gain | Latent heat gain of each occupant. | Numeric | W | ≥0 | | |
| status_type | Choice of new, existing, addition, alteration, etc. | <StatusOptions> | | | | |
| function | Generic function for the space. | <SpaceFunctionOptions> | | | | The enumeration is based on the standard used. |
| envelope_space_type | Envelope space type classification | <EnvelopeSpaceOptions2019ASHRAE901> | | | | The enumeration is based on the standard used. Often referred to as occupancy type. |
| lighting_space_type | Lighting space type classification | <LightingSpaceOptions2019ASHRAE901TG37> | | | | The enumeration is based on the standard used. |
| ventilation_space_type | Ventilation space type classification | <VentilationSpaceOptions2019ASHRAE901> | | | | The enumeration is based on the standard used. |
| service_water_heating_space_type | Service water heating space type classification | <ServiceWaterHeatingSpaceOptions2019ASHRAE901> | | | | 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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| modeling_method | The software methodology chosen for modeling infiltration | <InfiltrationMethodOptions> | | | | |
| algorithm_name | Name of the algorithm used for modeling infiltration in the specific simulation engine. | String | | | | |
| measured_air_leakage_rate | Measured air leakage rate from infiltration of outside air | Numeric | m3/s | ≥0 | | Based on the pressure described in ASHRAE229.measured_infiltration_pressure_difference. If a zone includes multiple spaces and infiltration is specified at the space level the rates should be aggregated to the zone. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|----------------------------------|---|------------------------|-------|----------|-----|---|
| <code>flow_rate</code> | Design infiltration flow rate | <code>Numeric</code> | 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. If a zone includes multiple spaces and infiltration is specified at the space level the rates should be aggregated to the zone. |
| <code>multiplier_schedule</code> | Referenced to the schedule containing the multiplier for the infiltration | <code>Reference</code> | | | | If the schedule is not present, the multiplier is always one. If a zone includes multiple spaces and infiltration is specified at the space level the rates and schedules should be aggregated to the zone. Constraint to use when implemented :Schedule: |

Surface

| Name | Description | Data Type | Units | Range | Req | Notes |
|-----------------------------|---|---|---------|----------|-----|---|
| <code>id</code> | Scope-unique reference identifier for instances of this data group | <code>ID</code> | | | ✓ | |
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | <code>String</code> | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>subsurfaces</code> | Subsurfaces that are on the surface | <code>[{Subsurface}]</code> | | | | Contains a list of surfaces that define the space. |
| <code>classification</code> | Classification for the surface. | <code><SurfaceClassificationOptions></code> | | | | Options for surface being interior or exterior wall, floor, or ceiling. |
| <code>area</code> | area of the surface | <code>Numeric</code> | m2 | ≥ 0 | | Measured from interior face area. It is the gross area of the wall and includes the area of all subsurfaces. |
| <code>tilt</code> | Angle between vertical and the surface outward normal | <code>Numeric</code> | degrees | | | Example value would be 0 = roof, 90 = wall, 180 = downward facing surface (exterior floor) |
| <code>azimuth</code> | Clockwise angle between North and the horizontal projection of the wall's outward normal. | <code>Numeric</code> | degrees | ≥ 0 | | Example values would be 0 = north, 90 = East, 180 = South, 270 = West. For rulesets with baseline rotations, the angle of the azimuth should be different for each baseline rotation. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|--------------------|---|--|-------|-------|-----|--|
| adjacent_to | Used to classify the conditions on the surface. | (<SurfaceAdjacencyOptions>,<AdditionalSurfaceAdjacencyOptionsRESNET>,<AdditionalSurfaceAdjacencyOptions2019ASHRAE901>) | | | | Determines whether the other side of the surface is modeled and if not what assumptions should be used. Commonly, plenums do not need to be explicitly described for many rulesets and instead when a plenum is present in the simulation model, this field should be set to the what is adjacent to the other side of the plenum. For example, on the top floor with a plenum, EXTERIOR would be entered. |
| adjacent_zone | ID of the adjacent zone for interior surface. Only required when adjacent zone is explicitly modeled when adjacent_to is set to INTERIOR. | Reference | | | | 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} | | | | |
| optical_properties | Optical properties of the surface. | {SurfaceOpticalProperties} | | | | |
| status_type | Choice of new, existing, addition, alteration, etc. for each ruleset. | <StatusOptions> | | | | |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| classification | Classification for the subsurface being window, skylight, door. | (<ConstructionClassificationOptions2019ASHRAE901>,<ConstructionClassificationOptions2019T24>) | | | | |
| surface_construction_input_option | Identifies whether construction is entered layer-by-layer or simplified (R-value) | <SurfaceConstructionInputOptions> | | | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|-----------------------------------|---|--|--------|------------------|-----|--|
| <code>fraction_framing</code> | Fraction of the construction that is framing. | <code>Numeric</code> | | $\geq 0, \leq 1$ | | Fraction of the construction using <code>framing_layers</code> , the remaining portion uses the <code>primary_layers</code> . If blank, assume zero framing. |
| <code>primary_layers</code> | List of names of layer descriptions starting from the outside surface for primary heat path | <code>[{Material}]</code> | | | | 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. |
| <code>framing_layers</code> | List of names of layer descriptions starting from the outside surface for the framing heat path | <code>[{Material}]</code> | | | | 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. |
| <code>insulation_locations</code> | List of locations for the insulation related to the surface that correspond to the values in the <code>r_values</code> list | <code>[<InsulationLocationOptions>]</code> | | | | |
| <code>u_factor</code> | surface U-factor | <code>Numeric</code> | W/m2-K | ≥ 0 | | Includes interior and exterior air films as specified by the referenced standard. |
| <code>c_factor</code> | surface C-factor | <code>Numeric</code> | W/m2-K | ≥ 0 | | Typically used to describe the thermal performance of constructions used in below grade walls. It is the time rate of steady-state heat flow through unit area of a material or construction, induced by a unit temperature difference between the body surfaces. Note that the C-factor does not include soil or air films. |
| <code>f_factor</code> | surface F-factor | <code>Numeric</code> | W/m-K | ≥ 0 | | Typically used to describe the thermal performance of constructions used in slab-on-grade floors. It is the heat transfer through the floor, induced by a unit temperature difference between the outside and inside air temperature, on the per linear length of the exposed perimeter of the floor. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|----------------------------------|---|------------------------|---------------------|-------|-----|-------|
| <code>r_values</code> | List of r-value of the insulation for the surface that correspond to values in the <code>insulation_locations</code> list | <code>[Numeric]</code> | K-m ² /W | ≥0 | | |
| <code>has_radiant_heating</code> | Includes embedded radiant heating elements | <code>Boolean</code> | | | | |
| <code>has_radiant_cooling</code> | Includes embedded radiant cooling elements | <code>Boolean</code> | | | | |

Material

| Name | Description | Data Type | Units | Range | Req | Notes |
|-----------------------------------|--|----------------------|---------------------|-------|-----|--|
| <code>id</code> | Scope-unique reference identifier for instances of this data group | <code>ID</code> | | | ✓ | |
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | <code>String</code> | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>thickness</code> | The thickness of the material layer | <code>Numeric</code> | m | >0 | | |
| <code>thermal_conductivity</code> | The thermal conductivity of the material layer | <code>Numeric</code> | W/m-K | ≥0 | | When <code>thermal_conductivity</code> is specified, <code>r_value</code> should not be provided. |
| <code>density</code> | The density of the material layer | <code>Numeric</code> | kg/m ³ | ≥0 | | |
| <code>specific_heat</code> | The specific heat of the material layer | <code>Numeric</code> | J/kg-K | ≥0 | | |
| <code>r_value</code> | r-value of the insulation for the material layer | <code>Numeric</code> | K-m ² /W | ≥0 | | When <code>r_value</code> is specified, <code>thermal_conductivity</code> should not be provided. Typically used for insulation or air gaps. |

SurfaceOpticalProperties

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

| Name | Description | Data Type | Units | Range | Req | Notes |
|---|--|-----------|-------|----------|-----|---|
| <code>absorptance_thermal_interior</code> | 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 |
| <code>absorptance_solar_interior</code> | 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 |
| <code>absorptance_visible_interior</code> | 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 |
|--------------------------------|--|---|-------|-------|-----|--|
| <code>id</code> | Scope-unique reference identifier for instances of this data group | ID | | | ✓ | |
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | String | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | String | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>classification</code> | Classification for the subsurface being window, skylight, door. | <SubsurfaceClassificationOptions> | | | | |
| <code>subclassification</code> | Standard specific subclassification for subsurfaces | <SubsurfaceSubclassificationOptions2019ASHRAE901> | | | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|---------------------------------------|---|---------------------------------------|--------|-------|-----|--|
| 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. | <SubsurfaceFrameOptions2019ASHRAE901> | | | | 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 | <SubsurfaceDynamicGlazingOptions> | | | | 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 |
| 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 | | | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|-------------|---|-----------------|-------|-------|-----|-------|
| status_type | Choice of new, existing, addition, alteration, etc. for each ruleset. | <StatusOptions> | | | | |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| purpose_type | Lighting purpose type classification | <LightingPurposeOptions2019ASHRAE901> | | | | 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 | Reference | | | | If the schedule is not present, the multiplier is always one. Constraint to use when implemented :Schedule: |
| occupancy_control_type | Indicates the type of occupancy controls | <LightingOccupancyControlOptions> | | | | |
| daylighting_control_type | Indicates the type of daylighting controls | <LightingDaylightingControlOptions> | | | | |
| 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 illuminance 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 | | | ✓ | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|----------------------------|---|---------------------------------|-------|-----------|-----|---|
| 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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| energy_type | Source of energy for the miscellaneous equipment in the space | <EnergySourceOptions> | | | | To indicate that the energy is not accounted for by any utility supplied source, choose NONE. To indicate equipment with a energy source from a Loop choose OTHER |
| power | Power for miscellaneous equipment in the space | Numeric | W | | | The value of power 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. | Reference | | | | If the schedule is not present, the multiplier is always one. 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. |
| remaining_fraction_to_loop | Referenced to the water fluid loop for the remaining fraction | Reference | | | | If sensible_fraction and latent_fraction add up to less than 1.0 and this field is specified then the chilled water or condenser water loop specified gets the remaining fraction of the miscellaneous load. Constraint to use when implemented :FluidLoop: |
| energy_from_loop | Referenced to the loop serving as the source of energy | Reference | | | | References the loop that is the source of energy for the miscellaneous equipment. Example would be hot water that is used for laundry in the zone. When this is used the energy_type should be set to OTHER. Constraint to use when implemented :FluidLoop: |
| type | Type of miscellaneous equipment | <MiscellaneousEquipmentOptions> | | | | |
| 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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| type | The type of transformer | <TransformerOptions> | | | | |
| phase | The number of electrical phases | <ElectricalPhaseOptions> | | | | |
| 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 transformer 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 | | | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|---------------------------------|---|--|-------|-------|-----|---|
| notes | Supplementary information to provide context to the model reviewer | String | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| 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 RMDs. Examples include thermostat, multiplier for lighting, availability for equipment. |
| sequence_type | Schedule sequence type | <ScheduleSequenceOptions> | | | | |
| hourly_values | Hourly Values of Schedule | [Numeric] [0..8784] | | | | 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. |
| hourly_heating_design_day | Hourly values for heating design day | [Numeric] [0..24] | | | | Used when schedule_sequence_type is HOURLY. |
| hourly_cooling_design_day | Hourly values for cooling design day | [Numeric] [0..24] | | | | Used when schedule_sequence_type is HOURLY. |
| 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. |
| event_times_heating_design_day | Event times when the schedule changes for heating design day | [Numeric] | s | | | Used when schedule_sequence_type is EVENT. |
| event_values_heating_design_day | Event value at corresponding event time for heating design day | [Numeric] | | | | Used when schedule_sequence_type is EVENT. New values starting at corresponding to the event time until following event time minus one second. |
| event_times_cooling_design_day | Event times when the schedule changes for cooling design day | [Numeric] | s | | | Used when schedule_sequence_type is EVENT. |
| event_values_cooling_design_day | Event value at corresponding event time for cooling design day | [Numeric] | | | | Used when schedule_sequence_type is EVENT. New values starting at corresponding to the event time until following event time minus one second. |
| type | The type of schedule | <ScheduleOptions> | | | | 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_type | Options when any schedule values have changed from what appears in the schedule library | <PrescribedScheduleOptions2019ASHRAE901> | | | | Some rule sets prescribe which schedules to use for modeling purposes. This option indicates if the schedule is as prescribed or has been modified. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|---|---|----------------------|-------|-------|-----|--|
| <code>is_modified_for_workaround</code> | True if any schedule has been modified for a workaround | <code>Boolean</code> | | | | Not all technologies can be modeled directly in the simulation program. Modifying schedules is a common workaround for modeling some technologies. This flag is used to indicate when a schedule has been modified for this purpose. |

Calendar

| Name | Description | Data Type | Units | Range | Req | Notes |
|--|--|---------------------------------------|-------|-------|-----|--|
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>day_of_week_for_january_1</code> | Day of the week for January 1 | <code><DayOfWeekOptions></code> | | | | |
| <code>is_leap_year</code> | The schedules assume it is a leap year | <code>Boolean</code> | | | | This value is true if the calendar and schedules include February 29. |
| <code>has_daylight_saving_time</code> | The schedules adjust for Daylight Saving Time | <code>Boolean</code> | | | | This value should be true if the modeled calendar includes daylight saving time. |

Weather

| Name | Description | Data Type | Units | Range | Req | Notes |
|--|--|--|-------|-------|-----|--|
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>ground_temperature_schedule</code> | Ground temperature schedule name | <code>Reference</code> | | | | Constraint to use when implemented :Schedule: |
| <code>file_name</code> | The file name for the weather file including extension. | <code>String</code> | | | | The file name for the annual weather file such as from TMY, TRY, CWC, CTZ, WYEC or other sources. |
| <code>data_source_type</code> | Data source use for the weather file. | <code><WeatherFileDataSourceOptions></code> | | | | |
| <code>climate_zone</code> | The designation of the climate zone where the building is located | <code><ClimateZoneOptions2019ASHRAE90I></code> | | | | The enumeration is based on the standard used. |
| <code>cooling_design_day_type</code> | The frequency of occurrence type for cooling design day | <code><CoolingDesignDayOptions></code> | | | | |
| <code>heating_design_day_type</code> | The frequency of occurrence type for heating design day | <code><HeatingDesignDayOptions></code> | | | | |

Elevator

| Name | Description | Data Type | Units | Range | Req | Notes |
|--------------------------------------|--|--------------------------------------|-------|------------------------|-----|--|
| <code>id</code> | Scope-unique reference identifier for instances of this data group | <code>ID</code> | | | ✓ | |
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | <code>String</code> | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>type</code> | The type of elevator | <code><ElevatorOptions></code> | | | | |
| <code>motor_location_zone</code> | Zone where the heat from the motor goes | <code>Reference</code> | | | | When specified, it is the zone the heat from the elevator motor get added to. Constraint to use when implemented :Zone: |
| <code>motor_heat_fraction</code> | Fraction of heat from the motor that is added as a sensible load zone. | <code>Numeric</code> | | ≥ 0 , ≤ 1 | | |
| <code>cab_location_zone</code> | Zone where the heat from the cab goes | <code>Reference</code> | | | | 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. Constraint to use when implemented :Zone: |
| <code>cab_heat_fraction</code> | Fraction of heat from the cab that is added as a sensible load zone. | <code>Numeric</code> | | ≥ 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 |
| <code>is_variable_speed_motor</code> | If the elevator uses a variable speed motor drive | <code>Boolean</code> | | | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|---|---|-----------|-------|-------|-----|--|
| 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 | | | |
| cab_weight | Weight of elevator car | Numeric | kg | | | |
| design_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 | Lighting 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 | Reference | | | | If the schedule is not present, the multiplier is always one. Constraint to use when implemented :Schedule: |
| cab_ventilation_fan_multiplier_schedule | Elevator ventilation fan operation multiplier schedule name | Reference | | | | If the schedule is not present, the multiplier is always one. Constraint to use when implemented :Schedule: |
| cab_lighting_multiplier_schedule | Elevator lighting multiplier schedule name | Reference | | | | If the schedule is not present, the multiplier is always one. Constraint to use when implemented :Schedule: |

HeatingVentilatingAirConditioningSystem

| Name | Description | Data Type | Units | Range | Req | Notes |
|------|--|-----------|-------|-------|-----|-------|
| id | Scope-unique reference identifier for instances of this data group | ID | | | ✓ | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|-----------------------------|--|------------------------------------|-------|-------|-----|---|
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | <code>String</code> | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>fan_system</code> | Fan system | <code>{FanSystem}</code> | | | | One FanSystem for each HeatingVentilatingAirConditioningSystem so if a direct outdoor air system is used a second Zone Terminal should be specified with a separate HeatingVentilatingAirConditioningSystem. |
| <code>heating_system</code> | Heating system | <code>{HeatingSystem}</code> | | | | References the HeatingSystem data group that acts as the main heating system or coil for this HVAC System. If the HVAC system does not have a heating system, this entry can be left blank, or the HeatingSystem HeatingSystemOptions can be set to equal NONE. |
| <code>cooling_system</code> | Cooling system | <code>{CoolingSystem}</code> | | | | References the CoolingSystem data group associated with this HVAC System. If the HVAC system does not have a cooling system, this entry can be left blank, or the CoolingSystem CoolingSystemOptions can be set to equal NONE. |
| <code>preheat_system</code> | Pre-heating system | <code>{HeatingSystem}</code> | | | | References a HeatingSystem data group that provides preheat to this HVAC System. Preheat is typically a coil used to temper cold air entering an HVAC system often when high quantities of outdoor air is expected. If the HVAC system does not have a preheat system, this entry can be left blank, or the HeatingSystem HeatingSystemOptions can be set to equal NONE in the referenced data group. |
| <code>status_type</code> | Choice of new, existing, addition, alteration, etc. for each ruleset. | <code><StatusOptions></code> | | | | |

HeatingSystem

| Name | Description | Data Type | Units | Range | Req | Notes |
|-----------------------------|--|---------------------|-------|-------|-----|--|
| <code>id</code> | Scope-unique reference identifier for instances of this data group | <code>ID</code> | | | ✓ | |
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | <code>String</code> | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |

| Name | Description | Data Type | Units | Range | Req | Notes |
|------------------------------|---|------------------------|-------|-------|-----|---|
| type | Heating system type | <HeatingSystemOptions> | | | | System configurations that typically are at the zone and include a compressor (such as packaged terminal air conditioning, packaged terminal heat pumps, window air conditioning units, and water loop heat pumps) should be reported in the schema using HeatingSystem and CoolingSystem. Systems that include gas or electric furnaces should be reported in the schema using HeatingSystem. System configurations that are at the zone and only include fans and coils (such as four-pipe fan coil, two-pipe fan coil, radiant systems, baseboards, and chilled beams) should be reported in the schema using Terminal with the chilled water and hot water systems described in the cooling_source and heating_source data elements (and any other relevant Terminal Data elements). Evaporative cooling systems should be described in CoolingSystem. Passive diffusers with no coil or fan should be described in Terminal. |
| energy_source_type | Source of energy for the heating system | <EnergySourceOptions> | | | | |
| hot_water_loop | Referenced to the hot water fluid loop | Reference | | | | Constraint to use when implemented :FluidLoop: |
| water_source_heat_pump_loop | Referenced to the water fluid loop to support water source heat pumps | Reference | | | | Constraint to use when implemented :FluidLoop: |
| design_capacity | Design heating capacity | Numeric | W | ≥0 | | Design capacity may be determined by sizing performed by the software. This value should be provided if sized by the simulation software as an output or explicitly provided as a simulation input. |
| rated_capacity | Rated heating capacity | Numeric | W | ≥0 | | At rating conditions. The rated capacity is generally used to determine efficiency level when efficiency level is based on size. It is net heating capacity taking into account the heat from the indoor fan. |
| 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. |
| is_sized_based_on_design_day | True if the component is sized by the simulation software for the design day | Boolean | | | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|---|---|---------------------------------|-------|-------|-----|--|
| heating_coil_setpoint | Setpoint of the air leaving the heating coil | Numeric | C | | | The setpoint of the air leaving the heating coil at design conditions. |
| efficiency_metric_values | List of efficiency metric values that correspond to the descriptors in efficiency_metric_types list | [Numeric] | W/W | | | Used for furnace or heat pump. |
| efficiency_metric_types | List of efficiency metrics that correspond to the values in efficiency_metric_values list | [<HeatingMetricOptions>] | | | | Used for furnace or heat pump. |
| heatpump_auxilliary_heat_type | Heatpump auxilliary heat type used for backup | <HeatpumpAuxilliaryHeatOptions> | | | | |
| heatpump_auxilliary_heat_high_shutoff_temperature | Heatpump auxilliary heat high temperature shutoff | Numeric | C | | | |
| heatpump_low_shutoff_temperature | Heatpump low temperature shutoff | Numeric | C | | | |
| humidification_type | Humidification type | <HumidificationOptions> | | | | |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| type | Cooling system type | <CoolingSystemOptions> | | | | System configurations that typically are at the zone and include a compressor (such as packaged terminal air conditioning, packaged terminal heat pumps, window air conditioning units, and water loop heat pumps) should be reported in the schema using HeatingSystem and CoolingSystem. Systems that include gas or electric furnaces should be reported in the schema using HeatingSystem. System configurations that are at the zone and only include fans and coils (such as four-pipe fan coil, two-pipe fan coil, radiant systems, baseboards, and chilled beams) should be reported in the schema using Terminal with the chilled water and hot water systems described in the cooling_source and heating_source data elements (and any other relevant Terminal Data elements). Evaporative cooling systems should be described in CoolingSystem. Passive diffusers with no coil or fan should be described in Terminal. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|-------------------------------|---|---------------------------|-------|-------|-----|---|
| design_total_cool_capacity | Design total cooling capacity | Numeric | W | ≥0 | | Designed total cooling capacity. Design capacity may be determined by sizing performed by the software. This value should be provided if sized by the simulation software as an output or explicitly provided as a simulation input. |
| design_sensible_cool_capacity | Design sensible cooling capacity | Numeric | W | ≥0 | | Designed sensible cooling capacity. Design sensible capacity may be determined by sizing performed by the software. This value should be provided if sized by the simulation as an output or explicitly provided as a simulation input. |
| rated_total_cool_capacity | Rated total cooling capacity | Numeric | W | ≥0 | | At rating conditions. The rated capacity is generally used to determine efficiency level when efficiency level is based on size. It is net cooling capacity taking into account the heat from the indoor fan. |
| rated_sensible_cool_capacity | Rated sensible cooling capacity | Numeric | W | ≥0 | | At rating conditions. The rated capacity is generally used to determine efficiency level when efficiency level is based on size. It is net sensible cooling capacity taking into account the heat from the indoor fan. |
| oversizing_factor | The oversizing factor applied to the peak load that results in the cool capacity. Zero indicates no oversizing. | Numeric | | ≥0 | | |
| is_sized_based_on_design_day | True if the component is sized by the simulation software for the design day | Boolean | | | | |
| chilled_water_loop | Referenced to the Chilled water fluid loop | Reference | | | | Constraint to use when implemented :FluidLoop: |
| condenser_water_loop | Referenced to the Condenser water fluid loop | Reference | | | | Constraint to use when implemented :FluidLoop: |
| efficiency_metric_values | List of efficiency metric values that correspond to the descriptors in efficiency_metric_types list | [Numeric] | W/W | | | Used for direct expansion. |
| efficiency_metric_types | List of efficiency metrics that correspond to the values in efficiency_metric_values list | [<CoolingMetricOptions>] | | | | Used for direct expansion. |
| dehumidification_type | Dehumidification type | <DehumidificationOptions> | | | | |
| cooling_turndown_ratio | Cooling turndown ratio | Numeric | | | | Cooling capacity turndown before simultanenous heating and cooling occurs. |

FanSystem

| Name | Description | Data Type | Units | Range | Req | Notes |
|------|--|-----------|-------|-------|-----|-------|
| id | Scope-unique reference identifier for instances of this data group | ID | | | ✓ | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|---|---|--|-------|------------|-----|--|
| 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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| supply_fans | List of supply fans | [{Fan}] | | | | List of fans that supply air by the HVAC system and are located in the building. |
| return_fans | List of return fans | [{Fan}] | | | | List of fans that return air to the HVAC system and are located in the building. |
| exhaust_fans | List of exhaust fans | [{Fan}] | | | | List of fans that exhaust air from the building either at the air handler or located in various spaces. The fans are located in the building. |
| relief_fans | List of relief fans | [{Fan}] | | | | List of fans that exhaust air from the building at the air handler to maintain proper pressurization. The fans are located in the building. |
| air_economizer | Air side economizer related to the fan system | {AirEconomizer} | | | | |
| air_energy_recovery | Air side energy recovery related to the fan system | {AirEnergyRecovery} | | | | |
| temperature_control | Supply air temperature control type | <FanSystemTemperatureControlOptions> | | | | |
| operation_during_occupied | Operation during occupied times type | <FanSystemOperationOptions> | | | | |
| operation_during_unoccupied | Operation during unoccupied times type | <FanSystemOperationOptions> | | | | |
| has_lock_out_central_heat_during_unoccupied | Locks out the use of central heating during unoccupied hours | Boolean | | | | Typically used when zone has heating coil available that can serve unoccupied heating load. |
| fan_control | Supply fan control type | <FanSystemSupplyFanControlOptions> | | | | |
| 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 temperature when no cooling load. The supply air temperature is specified in Terminal. |
| supply_air_temperature_reset_load_fraction | Supply air temperature reset load fraction | Numeric | | | | When temperature_control is LOAD_RESET_TO_SPACE_TEMPERATURE, this is the threshold fraction below which supply air temperature reset begins. Between the stated load fraction and 0% load the supply air temperature is ramped linearly until the supply air temperature reaches the zone. The supply air temperature is specified in Terminal. |
| supply_air_temperature_reset_schedule | Supply air temperature reset schedule | Reference | | | | The supply air temperature is specified in Terminal. Constraint to use when implemented :Schedule: |
| fan_volume_reset_type | Fan volume reset control type | <FanSystemSupplyFanVolumeResetOptions> | | | | |
| 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 instantaneous operating capacity that corresponds to minimum air flow. |
| operating_schedule | Operating schedule name | Reference | | | | If the schedule is not present, the fansystem is always operating. Zero when fan is off. Constraint to use when implemented :Schedule: |
| minimum_airflow | Minimum volume airflow | Numeric | L/s | | | The minimum airflow may be determined by sizing performed by the softare. This value should be provided if sized by the simulation software as an output or explicitly provided as a simulation input. |
| minimum_outdoor_airflow | Minimum outdoor air volume airflow | Numeric | L/s | | | If the minimum_outdoor_airflow is equal to the maximum_outdoor_airflow and equal to the total supply fan volume that indicates a constant volume dedicated outdoor air system. If only the maximum_outdoor_airflow and equal to the total supply fan volume but the minimum_outdoor_airflow is lower that indicates an air side economizer. |
| maximum_outdoor_airflow | Maximum outdoor air volume airflow | Numeric | L/s | | | If the minimum_outdoor_airflow is equal to the maximum_outdoor_airflow and equal to the total supply fan volume that indicates a constant volume dedicated outdoor air system. If only the maximum_outdoor_airflow and equal to the total supply fan volume but the minimum_outdoor_airflow is lower that indicates an air side economizer. |
| air_filter_merv_rating | The MERV rating of the air filter | Numeric | | ≥1, ≤20 | | |
| has_fully_ducted_return | If the fan system has fully ducted return. | Boolean | | | | |
| demand_control_ventilation_control | Demand control ventilation control type | <DemandControlVentilationControlOptions> | | | | |

AirEconomizer

| Name | Description | Data Type | Units | Range | Req | Notes |
|---|--|---|-------|-------|-----|--|
| <code>id</code> | Scope-unique reference identifier for instances of this data group | <code>ID</code> | | | ✓ | |
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | <code>String</code> | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>type</code> | Type | <code><AirEconomizerOptions></code> | | | | |
| <code>high_limit_shutoff_temperature</code> | High limit temperature shutoff | <code>Numeric</code> | C | | | |
| <code>is_integrated</code> | True if the economizer and mechanical cooling system can work together | <code>Boolean</code> | | | | When the economizer is integrated with the mechanical cooling system it is capable of providing partial cooling even when additional mechanical cooling is required to meet the remainder of the cooling load. |

AirEnergyRecovery

| Name | Description | Data Type | Units | Range | Req | Notes |
|-----------------------------|--|--|-------|-------|-----|--|
| <code>id</code> | Scope-unique reference identifier for instances of this data group | <code>ID</code> | | | ✓ | |
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | <code>String</code> | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>type</code> | Energy recovery type | <code><EnergyRecoveryOptions></code> | | | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|--|--|--|-------|-------|-----|--|
| enthalpy_recovery_ratio | Enthalpy recovery ratio | Numeric | | | | The change in the enthalpy of the outdoor air supply divided by the difference between the outdoor air and entering exhaust air enthalpy, expressed as a percentage. |
| energy_recovery_operation | Energy recovery operation | <EnergyRecoveryOperationOptions> | | | | |
| energy_recovery_supply_air_temperature_control | Energy recovery supply air temperature control | <EnergyRecoverySupplyAirTemperatureControlOptions> | | | | |
| design_sensible_effectiveness | Design sensible effectiveness | Numeric | | | | |
| design_latent_effectiveness | Design latent effectiveness | Numeric | | | | |
| outdoor_airflow | Outdoor airflow | Numeric | L/s | | | |
| exhaust_airflow | Exhaust airflow | Numeric | L/s | | | |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| design_airflow | Design airflow | Numeric | L/s | | | The design airflow may be determined by sizing performed by the software. This value should be provided if sized by the simulation software as an output or explicitly provided as a simulation input. |
| is_airflow_sized_based_on_design_day | True if the airflow is sized by the simulation software for the design day | Boolean | | | | |
| specification_method | Options for how the fan is specified | <FanSpecificationMethodOptions> | | | | Indicates if the fan is specified using the SIMPLE method of just the design electric power or using the DETAILED method of using pressure rise, nameplate power, shaft power, total efficiency, and motor efficiency. |
| design_electric_power | Design electric fan power | Numeric | W | | | Only used when specification_method is set to Simple. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|--------------------------------|---|------------------------------|-------|------------------------|-----|---|
| design_pressure_rise | Pressure rise through fan at design flow conditions | Numeric | Pa | | | Only used when specification_method is set to Detailed |
| motor_nameplate_power | nameplate power of fan motor | Numeric | W | | | Only used when specification_method is set to Detailed. |
| shaft_power | fan shaft power | Numeric | W | | | Power delivered to the fan'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. |
| total_efficiency | Total fan efficiency | Numeric | | ≥ 0 , ≤ 1 | | Only used when specification_method is set to Detailed. It includes the overall efficiency of the combination of the fan, drive, and motor. |
| 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 | Reference | | | | When specified, it is the zone the heat from the fan motor get added to. Constraint to use when implemented :Zone: |
| status_type | Choice of new, existing, addition, alteration, etc. for each ruleset. | <StatusOptions> | | | | |
| 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. Certain rulesets may have a different minimum number of points. For example, 90.1 Appendix G expects 11 data points. |

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 | | | The rate of energy used by the fan at the given airflow. |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| type | Type of terminal | <TerminalOptions> | | | | System configurations that typically are at the zone and include a compressor (such as packaged terminal air conditioning, packaged terminal heat pumps, window air conditioning units, and water loop heat pumps) should be reported in the schema using HeatingSystem and CoolingSystem. Systems that include gas or electric furnaces should be reported in the schema using HeatingSystem. System configurations that are at the zone and only include fans and coils (such as four-pipe fan coil, two-pipe fan coil, radiant systems, baseboards, and chilled beams) should be reported in the schema using Terminal with the chilled water and hot water systems described in the cooling_source and heating_source data elements (and any other relevant Terminal Data elements). Evaporative cooling systems should be described in CoolingSystem. Passive diffusers with no coil or fan should be described in Terminal. |
| served_by_heating_ventilating_air_conditioning_system | HVAC system serving the terminal | Reference | | | | Contains ID of the HVAC system serving the terminal - from Unique Identification Number in HeatingVentilatingAirConditioningSystem. Constraint to use when implemented :HeatingVentilatingAirConditioningSystem: |
| heating_source | Source of heating | <HeatingSourceOptions> | | | | Used for terminal heating including reheat. |
| heating_from_loop | References the fluid loop used to provide heating | Reference | | | | 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 | <CoolingSourceOptions> | | | | Used for terminal cooling. |
| cooling_from_loop | Referenced the fluid loop used to provide cooling | Reference | | | | 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} | | | | The fan data group associated with the terminal. If no fan is modeled for this terminal, this field should be left blank. |
| fan_configuration | Fan configuration | <TerminalFanConfigurationOptions> | | | | |
| primary_airflow | Zone terminal primary airflow | Numeric | L/s | | | Zone terminal primary airflow at design conditions. |
| secondary_airflow | Zone terminal secondary airflow | Numeric | L/s | | | |
| max_heating_airflow | Zone terminal maximum heating airflow | Numeric | L/s | | | Entry only needed if maximum heating airflow is different than the primary airflow such as when describing a dual maximum VAV box control. |
| supply_design_heating_setpoint_temperature | Zone terminal supply design heating temperature setpoint | Numeric | C | | | |
| supply_design_cooling_setpoint_temperature | Zone terminal supply design cooling temperature setpoint | Numeric | C | | | |
| temperature_control | Temperature control type | <TerminalTemperatureControlOptions> | | | | |
| minimum_airflow | Zone terminal minimum volume airflow | Numeric | L/s | | | |
| minimum_outdoor_airflow | Zone terminal minimum outdoor air volume airflow | Numeric | L/s | | | This value should be provided if fan airflow determined by sizing performed by the software or explicitly provided. |
| minimum_outdoor_airflow_multiplier_schedule | Zone terminal minimum outdoor air volume airflow multiplier schedule name | Reference | | | | If the schedule is not present, the multiplier is always one. 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. This value should be provided if determined by sizing performed by the software or explicitly provided. |
| 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. This value should be provided if determined by sizing performed by the software or explicitly provided. |
| is_supply_ducted | True if the the supply is ducted. | Boolean | | | | Packaged terminal air conditioners (PTAC), packaged terminal heat pumps (PTHP), and window or through the wall air conditioners should be False and other DX systems including rooftop units should be True |

| Name | Description | Data Type | Units | Range | Req | Notes |
|--------------------------------|--|-----------|-------|-------|-----|--|
| 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. |
| is_fan_first_stage_heat | True if the the only source of first stage heating is the heat from the fan itself | Boolean | | | | Only appropriate with variable volume boxes that are fan powered |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| type | Type of loop | <FluidLoopOptions> | | | | |
| 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 | Fluid loop design and control used for cooling or condensing loops | {FluidLoopDesignAndControl} | | | | References a FluidLoopDesignAndControl data group which describes how this FluidLoop is sized and controlled in cooling or condensing mode. |
| heating_design_and_control | Fluid loop design and control used for heaing loops | {FluidLoopDesignAndControl} | | | | References a FluidLoopDesignAndControl data group which describes how this FluidLoop is sized and controlled in heating mode. |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| design_supply_temperature | Design Supply Temperature | Numeric | C | | | |
| design_return_temperature | Design Return Temperature | Numeric | C | | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|--|---|-------------------------------|-------|-------|-----|---|
| 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 | | | | The minimum flow rate expressed as a fraction of the loop design flow rate. |
| operation | Type of operation used by loop | <FluidLoopOperationOptions> | | | | |
| operation_schedule | Operation schedule | Reference | | | | One represents when the fluid loop is available 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 | <TemperatureResetOptions> | | | | |
| outdoor_high_for_loop_supply_reset_temperature | Outdoor high for loop supply temp reset | Numeric | C | | | Used when temperature_reset_type = OUTSIDE_AIR_RESET |
| outdoor_low_for_loop_supply_reset_temperature | 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 |
| has_integrated_waterside_economizer | True if chilled water loop described has an integrated waterside economizer | Boolean | | | | |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |

| Name | Description | Data Type | Units | Range | Req | Notes |
|-----------------------------------|--|----------------------------------|-------|-----------|-----|---|
| loop_or_piping | Referenced to the fluid loop or service water heating piping | Reference | | | ✓ | Data elements linking data groups by reference that don't make sense without the reference are shown as required. Few other data elements than this type and id data elements are shown as required. Other data elements may be required by specific rulesets. 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 | | | This value should be provided if determined by sizing performed by the software or explicitly provided. |
| is_flow_sized_based_on_design_day | True if the design_flow is sized by the simulation software for the design day | Boolean | | | | |
| output_validation_points | Energy validation points | [{PumpOutputValidationPoint}] | | | | Pump flow is input to each validation point and energy output is the result. A minimum number of four points is recommended. |

PumpOutputValidationPoint

| Name | Description | Data Type | Units | Range | Req | Notes |
|--------|-------------|-----------|-------|-------|-----|---|
| flow | Flow rate | Numeric | L/s | | | No name and id is needed since typically used as one of a series. |
| result | Result | Numeric | W | | | The rate of energy used by the pump at the given flow rate. |

Boiler

| Name | Description | Data Type | Units | Range | Req | Notes |
|---------------------------------------|--|--|-------|-----------|-----|---|
| <code>id</code> | Scope-unique reference identifier for instances of this data group | <code>ID</code> | | | ✓ | |
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | <code>String</code> | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>loop</code> | Referenced to the fluid loop | <code>Reference</code> | | | ✓ | Data elements linking data groups by reference that don't make sense without the reference are shown as required. Few other data elements than this type and id data elements are shown as required. Other data elements may be required by specific rulesets. Constraint to use when implemented :FluidLoop: |
| <code>design_capacity</code> | Heating capacity | <code>Numeric</code> | W | | | |
| <code>rated_capacity</code> | Heating capacity | <code>Numeric</code> | W | | | At rating conditions. |
| <code>minimum_load_ratio</code> | Minimum fraction of full load allowed | <code>Numeric</code> | | | | |
| <code>draft_type</code> | Combustion option | <code><BoilerCombustionOptions></code> | | | | |
| <code>energy_source_type</code> | Source of energy for the boiler | <code><EnergySourceOptions></code> | | | | |
| <code>efficiency_metric</code> | The type of efficiency metric used | <code><BoilerEfficiencyMetricOptions></code> | | | | |
| <code>efficiency</code> | Efficiency value based on the selected <code>efficiency_metric</code> | <code>Numeric</code> | | ≥0, ≤1 | | |
| <code>output_validation_points</code> | Energy validation points | <code>[{BoilerOutputValidationPoint}]</code> | | | | Load is input to each validation point and energy output is the result. A minimum number of four points is recommended. |
| <code>auxiliary_power</code> | Auxiliary power | <code>Numeric</code> | W | | | Power for boiler pump, combustion fan, or other auxiliary that operates when boiler operates. |
| <code>operation_lower_limit</code> | Heating load range operation, lower limit | <code>Numeric</code> | W | | | The heating rate below which the boiler will not operate. This is often used in plants that have multiple boilers to specify how they should be sequenced. |
| <code>operation_upper_limit</code> | Heating load range operation, upper limit | <code>Numeric</code> | W | | | The heating rate above which the boiler will not operate. This is often used in plants that have multiple boilers to specify how they should be sequenced. |

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. |
| entering_water_temperature | Entering water temperature | Numeric | C | | | Temperature of water entering the boiler which returned from the loop. This entry is optional since not all curves for boiler performance need this. |
| 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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| cooling_loop | Referenced to the cooling fluid loop | Reference | | | ✓ | Data elements linking data groups by reference that don't make sense without the reference are shown as required. Few other data elements than this type and id data elements are shown as required. Other data elements may be required by specific rulesets. Constraint to use when implemented :FluidLoop: |
| condensing_loop | Referenced to the condensing fluid loop | Reference | | | | No condensing loop name implies air-cooled chiller. Constraint to use when implemented :FluidLoop: |
| compressor_type | Compressor Type | <ChillerCompressorOptions> | | | | |
| energy_source_type | Source of energy for the chiller | <EnergySourceOptions> | | | | |
| design_capacity | Chiller Design Cooling Capacity | Numeric | W | | | The capacity of the chiller at design conditions. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|---------------------------------------|---|--|-------|-----------|-----|--|
| rated_capacity | Chiller Rated Cooling Capacity | Numeric | W | | | At rating conditions. |
| rated_entering_condenser_temperature | Rated entering condenser temperature | Numeric | C | | | The rated outside air dry-bulb temperature for air cooled chillers or design entering condenser water temperature for water cooled chillers. For AHRI conditions for inch-pound ratings for air cooled chillers are 35C/95F and water cooled are 29.4C/85F. The AHRI conditions for SI ratings are 35C for air cooled chillers and 30C for water cooled. |
| rated_leaving_evaporator_temperature | Rated leaving evaporator temperature | Numeric | C | | | For AHRI conditions for inch-pound ratings are 6.7C/44F. For AHRI conditions for SI ratings are 7C. |
| 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 | | | |
| design_entering_condenser_temperature | Design entering condenser temperature | Numeric | C | | | The design outside air dry-bulb temperature for air cooled chillers or design entering condenser water temperature for water cooled chillers. |
| design_leaving_evaporator_temperature | Design leaving evaporator temperature | Numeric | C | | | The temperature leaving the evaporator portion of the chiller at design conditions. |
| full_load_efficiency | Full Load 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 | W/W | ≥0 | | |
| part_load_efficiency_metric | The type of part load efficiency metric used | <ChillerPartLoadEfficiencyMetricOptions> | | | | |
| 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 | | | | Should be set to true when the chiller and the chiller water pump are controlled to turn on an off at the same time. |
| is_condenser_water_pump_interlocked | Indicates if the operation of the condenser water pump is interlocked with the operation of the chiller | Boolean | | | | Should be set to true when the chiller and the condenser water pump are controlled to turn on an off at the same time. |
| heat_recovery_loop | Recovered heat to fluid loop | Reference | | | | Constraint to use when implemented :FluidLoop: |
| heat_recovery_fraction | Heat recovery fraction | Numeric | | ≥0, ≤1 | | Fraction of total rejected heat that can be recovered at full load |

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 chillers 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 chillers this the temperature of the ambient air. |
| Load | Load | Numeric | W | | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|----------------------------------|-------------------------------------|----------------------|-------|-------|-----|--|
| <code>is_at_full_capacity</code> | True if chiller is at full capacity | <code>Boolean</code> | W | | | True if chiller is operating at full capacity for the given temperature conditions |
| <code>result</code> | Result | <code>Numeric</code> | W | | | |

HeatRejection

| Name | Description | Data Type | Units | Range | Req | Notes |
|--|--|--|-------|-------|-----|--|
| <code>id</code> | Scope-unique reference identifier for instances of this data group | <code>ID</code> | | | ✓ | |
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | <code>String</code> | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>loop</code> | Referenced to the fluid loop | <code>Reference</code> | | | ✓ | Data elements linking data groups by reference that don't make sense without the reference are shown as required. Few other data elements than this type and id data elements are shown as required. Other data elements may be required by specific rulesets. Constraint to use when implemented :FluidLoop: |
| <code>type</code> | Heat Rejection Type | <code><HeatRejectionOptions></code> | | | | |
| <code>fan_type</code> | Heat Rejection Fan Type | <code><HeatRejectionFanOptions></code> | | | | |
| <code>fluid</code> | Fluid Cooled by Heat Rejection | <code><HeatRejectionFluidOptions></code> | | | | |
| <code>range</code> | Heat rejection Range | <code>Numeric</code> | K | | | |
| <code>approach</code> | Heat rejection Approach | <code>Numeric</code> | K | | | |
| <code>fan_shaft_power</code> | Fan Shaft Power | <code>Numeric</code> | W | | | Power delivered to the fan's shaft and does not include the mechanical drive losses. Equivalent to fan brake horsepower for inch-pound units. |
| <code>fan_motor_efficiency</code> | Efficiency of the fan motor at rating conditions | <code>Numeric</code> | W | | | From CBECC-Com. |
| <code>fan_motor_nameplate_power</code> | Fan Motor Nameplate Power | <code>Numeric</code> | W | | | The nameplate power at rating conditions. In inch-pound units is the fan motor horsepower.From CBECC-Com. |
| <code>fan_speed_control</code> | Fan Speed Control Type | <code><HeatRejectionFanSpeedControlOptions></code> | | | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|------------------------------------|------------------------------------|-----------|-------|-------|-----|-----------------------|
| 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. |
| leaving_water_setpoint_temperature | leaving water setpoint temperature | Numeric | C | | | |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| loop | Referenced to the fluid loop | Reference | | | ✓ | Data elements linking data groups by reference that don't make sense without the reference are shown as required. Few other data elements than this type and id data elements are shown as required. Other data elements may be required by specific rulesets. Constraint to use when implemented :FluidLoop: |
| type | Type of external fluid source | <ExternalFluidSourceOptions> | | | | |
| energy_source_type | Source of energy for the external fluid source | <EnergySourceOptions> | | | | |

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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| 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 | <ServiceWaterHeatingDistributionCompactnessOptions2019T24Com> | | | | From CBECC-Com. |
| control_type | Type of distribution system | <ServiceWaterHeatingControlOptions2019T24Com> | | | | From CBECC-Com. |
| configuration_type | Type of configuration | <ServiceWaterHeatingConfigurationOptions> | | | | 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 | <ServiceWaterHeatingHeatRecoveryOptions> | | | | From CBECC-Res. |
| flow_multiplier_schedule | service water heating Loop flow multiplier schedule name | Reference | | | | If the schedule is not present, the multiplier is always one. 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. | Reference | | | | 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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |

| Name | Description | Data Type | Units | Range | Req | Notes |
|-----------------------|---|----------------------------|-------|-------|-----|--|
| 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 | <ComponentLocationOptions> | | | | From CBECC-Com. |
| location_zone | Zone reference of where the component is located when IN_ZONE is selected from ComponentLocationOptions | Reference | | | | 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 | 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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| 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. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|-----------------|---|-----------|-------|-------|-----|---|
| 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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| heater_fuel_type | Service water heating heater fuel type | <EnergySourceOptions> | | | | |
| distribution_system | Referenced to the service water heating distribution system | Reference | | | ✓ | Data elements linking data groups by reference that don't make sense without the reference are shown as required. Few other data elements than this type and id data elements are shown as required. Other data elements may be required by specific rulesets. 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 | Reference | | | | From CBECC-Com. Constraint to use when implemented :Zone: |
| compressor_heat_rejection_source | Heat pump heat rejection source | <ComponentLocationOptions> | | | | From CBECC-Res. |
| compressor_heat_rejection_zone | Heat pump heat rejection zone | Reference | | | | 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. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|-------------------------|---|-----------------------------|-------|-------|-----|---|
| has_electrical_ignition | Indicates whether the water heater has electrical ignition | Boolean | | | | From CBECC-Com. |
| heater_type | Service water heater type | <ServiceWaterHeaterOptions> | | | | |
| 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. | <StatusOptions> | | | | |
| 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 | Reference | | | | 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 | | | |

HeatPumpWaterHeaterPowerValidationPoint

| 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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| storage_capacity | Storage capacity of tank in distribution system | Numeric | L | ≥0 | | From CBECC-Com. |
| type | Service water heater tank type | <ServiceWaterHeaterTankOptions> | | | | |
| height | Tank height | Numeric | m | ≥0 | | From CBECC-Com. |

| Name | Description | Data Type | Units | Range | Req | Notes |
|----------------------------------|----------------------------------|---|--------|----------|-----|--|
| <code>interior_insulation</code> | Tank interior insulation R-value | <code>Numeric</code> | K-m2/W | ≥ 0 | | Insulation that is part of the tank and is inside of the housing. From CBECC-Res. |
| <code>exterior_insulation</code> | Tank exterior insulation R-value | <code>Numeric</code> | K-m2/W | ≥ 0 | | A blanket of insulation that surrounds the exterior of the tank. From CBECC-Res. |
| <code>location</code> | Location | <code><ComponentLocationOptions></code> | | | | From CBECC-Res. |
| <code>location_zone</code> | Tank zone location | <code>Reference</code> | | | | Only used when <code>tank_location</code> 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 |
|---|--|---|-------|-------|-----|--|
| <code>id</code> | Scope-unique reference identifier for instances of this data group | <code>ID</code> | | | ✓ | |
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | <code>String</code> | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| <code>area_type</code> | Service Water Heating Loop Area Type | <code><ServiceWaterHeatingSpaceOptions2019ASHRAE90I></code> | | | | The enumeration is based on the standard used. |
| <code>water_serves_type</code> | The use of the water serves the type | <code><ServiceWaterHeatingFixtureOptions></code> | | | | |
| <code>served_by_distribution_system</code> | ID to the ServiceWaterHeatingDistributionSystem that serves this end use | <code>Reference</code> | | | | From CBECC-Res. Constraint to use when implemented :ServiceWaterHeatingDistributionSystem: |
| <code>use</code> | Usage of service hot water | <code>Numeric</code> | | | | This field together with the <code>use_units</code> and <code>use_multiplier_schedule</code> fields allow detailed description of the ServiceWaterHeating use in the units selected in the <code>use_units</code> field. |
| <code>use_units</code> | Type of units for use of service hot water | <code><ServiceWaterHeatingUseUnitOptions></code> | | | | |
| <code>use_multiplier_schedule</code> | Reference to the schedule containing the multiplier for the use of service hot water | <code>Reference</code> | | | | If the schedule is not present, the multiplier is always one. Constraint to use when implemented :Schedule: |
| <code>temperature_at_fixture</code> | Reference to the schedule containing the multiplier for the use of service hot water | <code>Numeric</code> | C | | | From RESNET |
| <code>is_heat_recovered_by_drain</code> | Indicates if heat is being recovered from the drain | <code>Boolean</code> | | | | From CBECC-Res. |
| <code>is_recovered_heat_used_by_cold_side_feed</code> | Indicates if heat is being recovered from the drain is used on the cold side feed | <code>Boolean</code> | | | | From CBECC-Res. |

ExteriorLighting

| Name | Description | Data Type | Units | Range | Req | Notes |
|-----------------------------|--|---------------------|-------|-------|-----|--|
| <code>id</code> | Scope-unique reference identifier for instances of this data group | <code>ID</code> | | | ✓ | |
| <code>reporting_name</code> | Descriptive name used in RCT reports if id is not already a descriptive name | <code>String</code> | | | | |
| <code>notes</code> | Supplementary information to provide context to the model reviewer | <code>String</code> | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |

| Name | Description | Data Type | Units | Range | Req | Notes |
|---------------------|---|--|-------|-------|-----|---|
| type | The type of exterior lighting fixture | <ExteriorLightingAreaOptions2019ASHRAE901TableG36> | | | | |
| area | Area of the exterior functional space. | Numeric | m2 | >0 | | The lit area, when the lighting allowance specified by the type is based on area. |
| 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 | Reference | | | | If the schedule is not present, the multiplier is always one. Constraint to use when implemented :Schedule: |

RefrigeratedCase

| 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 | | | | Notes are not used by the RCT, but may be included in RCT reports to give the reviewer additional information or context |
| type | Refrigerated case type | <RefrigeratedCaseOptions> | | | | |
| equipment_category | Equipment Class from referenced standard | <RefrigeratedCaseEquipmentCategoryOptions> | | | | |
| 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 | <ApplicationTemperatureOptions> | | | | Based on AHRI 1200 |
| power | Nominal power of refrigerated case | Numeric | W | >0 | | |
| power_multiplier_schedule | Refrigerated case power multiplier schedule name | Reference | | | | If the schedule is not present, the multiplier is always one. Constraint to use when implemented :Schedule: |
| sensible_fraction | Fraction of energy that is a sensible load on the space. | Numeric | | ≥-1, ≤1 | | |

| Name | Description | Data Type | Units | Range | Req | Notes |
|--------------------|--|-----------|-------|-------------------------|-----|---|
| heat_gain_fraction | Fraction of energy that is a heat gain to the space. | Numeric | | ≥ -1 , ≤ 1 | | |
| 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 | | | |
| zone | Zone where case is located | Reference | | | | Constraint to use when implemented :Zone: |